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DAIRY, FOOD AND ENVIRONMENTAL

SANITATION

DECEMBER 1992

A Publication of the International Association of Milk, Food and Environmental Sanitarians, Inc.

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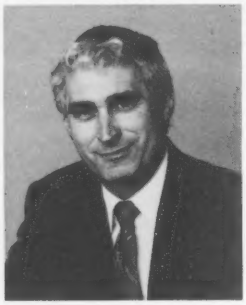

By
Michael P. Doyle
IAMFES President

Meeting the Professional Needs of IAMFES Members

Your IAMFES Executive Board has been active in studying ways your association can better provide services, programs, and publications to meet your professional needs. Many innovative ideas were addressed at the Board's fall meeting in November, and several were approved. You are encouraged to join in and participate in these new opportunities.

One area receiving attention was the establishment of additional Professional Development Groups to focus on issues not being addressed by our existing Groups. The new groups include: Meat Quality and Safety, Poultry Quality and Safety (Director - Stan Bailey, USDA-ARS, Athens), Seafood Quality and Safety (Director - Cameron Hackney, Virginia Tech), and Food Safety Network (Director - Bob Clark, Agriculture Canada). These Groups will be developing agenda that address timely issues and concerns in their respective areas. Anyone interested in participating in these Groups should contact the respective Group Director.

Our annual meeting has grown to one of international interest. A Task Force was established to initiate an aggressive undertaking to procure funds to sponsor invited speakers for the annual meeting. We anticipate this fund will provide resources to allow the Program Committee to invite well-recognized international scientists to participate in our meeting.

Two surveys will be initiated in the coming months. One will be a readership survey of *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection* to obtain input from our members and subscribers on their likes and dislikes of our publications. Please complete and return the tearout questionnaire in your upcoming issues of the journals and let your thoughts be known. The second survey will be done over the telephone as part of our long range planning activities. Many of you will be asked for your ideas about what directions IAMFES should take to address your professional interest. If called, please take the time to respond to the interviewer's questions.

Students are very important to the future of IAMFES. Your association is interested in increasing student involvement in its activities. Realizing the limited budgets students have while going to school, the Board established a policy to provide a special half price rate for IAMFES publications to all student members.

Your Executive Board is continually looking for ways in which IAMFES can better serve its members. Please let us know if you have any suggestions.

On My Mind . . .

By
Steven K. Halstead, CAE
IAMFES
Executive Manager

At year's end, people tend to take a look at the past twelve months and evaluate how they did. Associations are no different. With that in mind, I would like to share with you some of the things that IAMFES accomplished this year.

- **Office Relocation**: On Friday, September 11, we moved from Ames to the north side of Des Moines. We did this with virtually no interruption in services to our membership. We were almost totally up and running by Monday and would have been totally if the phone company had been less helpful. As it happened, the local office and the regional office got their wires twisted, so while one was trying to put the toll free phone on one incoming line, the other was trying to put it on another line. Thus, callers were getting a message that the line was not in service. By Tuesday, they had everything straightened out and things have been fine since.

We started our search from scratch in January, so you can see that there was a lot of time and energy involved in the move. I think that if you were sitting here now, you would agree that it was worth it.

- **Affiliate Council**: Since my early work in association management was at the state level, it is natural that I would have a great desire to see our affiliates thrive. My frustration has been in trying to figure out what we could do to help that happen. One way seemed to be through the Affiliate Council.

The Affiliate Council represents the leadership of our affiliates. As with any group of leaders, it is sometimes difficult to get them all leading in the same direction, but I truly believe that this year we started down the road. The path will not always be easy, but if we can work together, we can get there.

It seems to me that their call for input on the Annual Meeting program, and on the nominations committee as well as their desire to improve the communications between IAMFES and the affiliates sends a message that this group is ready to accomplish some wonderful things for the association. I will certainly do what I can to help them.

- **Financial Health of IAMFES**: This year we changed the fiscal year of IAMFES so that now the Annual Meeting is in the same period as the budget. You'd be surprised how much confusion was created by having them in different years. Almost as much confusion can be generated by changing the fiscal year. At least in the first year when you are suddenly faced with a fourteen month year; two annual meetings; etc.

From the report of our auditors, shown on page 807, I hope that you can see that we are making good use of our resources. Please note that this is a cash basis report and ignores the financial obligations we have to members and subscribers who have paid dues but have not gotten their full year of membership value yet.

Even then, it is quite positive and shows that we are making progress towards establishing a cash reserve.

- **Strategic Long Range Planning**: In 1992, we made great progress in putting together a Strategic Long Range Plan. A task force of some twenty four persons representing all aspects of IAMFES gathered in Toronto to begin the process. A report of that meeting has been written and is available to those interested. The report identifies many of the questions that must be answered before we can write the plan itself.

During the month of December, our planning consultants, Lawrence-Leiter and Associates, will begin doing the first of some two hundred telephone surveys. The surveying and tabulating is to be done in time for the March Executive Board meeting.

The questions asked will help us to understand the directions we will be going in the years ahead. Should you happen to be asked to participate in the survey, please agree and share with us your vision of IAMFES' future.

- **The 1992 Annual Meeting**: This great accomplishment was discussed at length in the November issue, so I won't say anything more about it at this time.

Well, this is just a small sampling to the many wonderful things that happened in IAMFES this year. In all, it was a great year.

As we enter the holiday season, all of us here at the ~~Ames~~ -- oops Des Moines office--wish you the merriest of good cheer and the very best in the new year.

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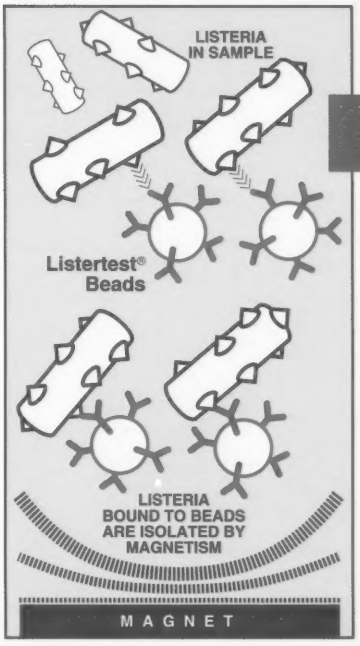

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Personal Cups in Hot Beverage Vending Machines

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ABSTRACT

This study examined the use of personal cups in hot beverage vending machines as a source of bacterial contamination. It was conducted in two phases. The first phase examined to what degree a ceramic cup must be contaminated to allow the survival of a significant number of bacteria after use in a hot beverage vending machine. Phase two examined the possibility the vending machine could be contaminated through the use of ceramic cups with known levels of bacteria present while simulating a normal vending day. The machine in this study was equipped to receive ceramic cups as well as vend paper cups through the installation of a new personal cup accessory kit. The machine was cleaned and sanitized after each simulated day of low, medium, and high vending. Equivalent numbers of paper cups were vended as a control. It was determined the ceramic cups had to be highly contaminated to allow the survival of significant numbers of bacteria and the vending stage of the machine itself was not affected by the use of soiled ceramic cups.

INTRODUCTION

In response to the concern to reduce the amount of solid waste generated in the U.S. several manufacturers of vending machines developed a hot beverage vending machine which allows the customer to use their own ceramic cup to obtain a beverage from the machine in lieu of receiving a paper cup during the normal vending cycle. Prior to the development of this accessory deliver method, the National Automatic Merchandising Association, (NAMA), Automatic Merchandising Health-Industry Council, (AMHIC), reviewed the design proposals, conducted a literature search, and worked with two state health departments to determine if this method of delivery posed any public health problems. Based on the information obtained, this alternative approach appeared to pose no problem to vending a hot beverage. To assure this would continue, AMHIC developed a technical bulletin entitled "The Personal Cup Option for Hot Beverage Vending Machines."

The personal cup option on a vending machine is based upon the placement and use of a standard ceramic cup in the vending stage. A 10 oz. ceramic cup measuring three and one half inches high and with a three inch diameter is the standard size chosen by AMHIC. The cup delivery mechanism in the vending machine must also meet the following criteria, (Figures 1 and 2):

a. From a point one and one quarter inches to two and one half inches from the bottom, there shall be only minimal point-to-point contact from any of the cup delivery or vending stage parts with the sides of the cup (2).
b. From a point two and one half inches from the bottom of the cup to the top of the cup, there shall be no contact between any of the cup delivery or vending stage parts with any part of the cup (2).

Figure 1

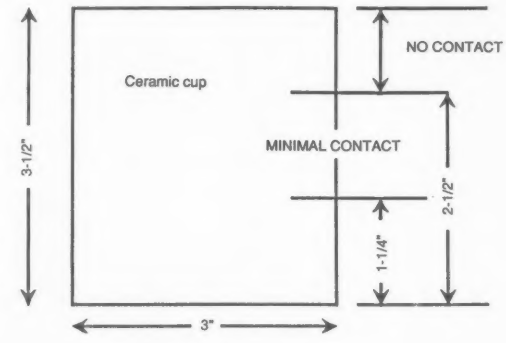
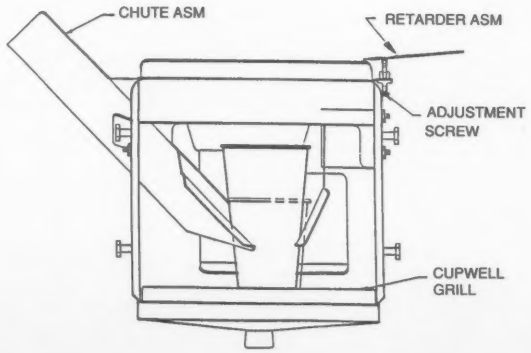


Figure 2



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The above practice may reduce the generation of solid waste, but it does not eliminate the public health concerns of basic sanitation and potential disease transmission through a process similar to a "common cup" scenario. The National Automatic Merchandising Association contacted Illinois State University to determine if the presence of the microorganisms on ceramic cups would contaminate the vending machine and, thereby, create a public health concern. Even though the earlier study by AMHIC indicated there should be no problem with this delivery method, this research was designed to specifically review the health risks associated with hot beverage vending machines which would allow the use of ceramic cups and attempted to answer the following questions:

a. To what degree must a ceramic cup be contaminated to allow the survival of a significant number of bacteria after use with a hot beverage?
b. What is the possibility that the vending machine may be contaminated through the use of ceramic cups with known levels of bacteria present while simulating normal vending.

The effects of high temperatures on the growth of microorganisms has been shown to decrease in an orderly logarithmic (1,4,7) fashion with respect to the temperature and time of exposure. This predictable destruction of microorganisms by heat has led to the development of thermal death curves and makes it possible to predetermine a heat process that will result in the desired level of destruction in a given food. The most extensive application of this concept is utilized for heat processed canned foods (5).

Factors of heat resistance, such as, the type of microorganisms present, the numbers of organisms present, the age of cells, the stage of growth, and the medium in which the microorganisms are heated, will all allow for the survival of microorganisms. Examples of studies which have shown the survival of microorganisms after heat processing includes: Ostovar and Keeney (3) who found various bacillus species were present after roasting cocoa beans at 150° C for forty minutes, and Strong and Ripp (6) who found *Clostridium perfringens* survived in turkey rolls cooked to an internal temperature of 84° C. Understanding the effects of heat and the heat resistance of microorganisms, this study anticipated the survival of microorganisms on the surface of ceramic cups after the addition of a hot beverage.

MATERIALS AND METHODS

Cultures

Organisms employed in this study were *Escherichia coli* and *Staphylococcus epidermidis* (from the American Type Culture Collection). The bacteria were grown on Tryptic Soy Agar (TSA) with 5% sheep blood plates at 35° C and were subcultured several times before using.

Organism Viability

To establish the level of contamination so approximately one hundred bacteria per cup, (the public health standard of placing an individual at risk), would survive after hot coffee was added, dilutions equivalent to the McFarland turbidity standard of one (density of approximately 3 x 10^8 per ml) for each bacteria in the study was utilized. The organisms were applied to a depth of one inch to the inside and outside rim of the cups using sterile cotton swabs. The same areas were swabbed after adding hot coffee and allowed to cool to an ambient temperature of 26°C. A cup in which no coffee was added, served as a control for each dilution. After trying several dilutions, it was found that a 1:400 dilution of the initial broth yielded the desired density of organisms.

Hot beverage machine installation and maintenance

In a cooperative effort with the National Automatic Merchandising Association and Illinois State University, Service America Corporation, a national vending company, installed a hot beverage vending machine equipped with a personal cup accessory kit. The machine was located in the environmental health laboratory in the Health Sciences building for restricted access. Hot beverages were dispensed to simulate low, medium, and high volume days. According to vending industry data, a low volume day is equivalent to two drinks per fifteen minutes, a medium volume day is equivalent to twelve drinks per fifteen minutes, and a high volume day is equivalent to twenty four drinks per fifteen minutes. The machine was washed with detergent, rinsed, and sanitized with a 200 ppm solution of chlorine after each simulated day's use with contaminated ceramic cups. The machine was then operated in the same manner of low, medium, and high vending days dispensing paper cups as a control. The machine was washed, rinsed, and sanitized after each simulated vending day for the paper cups as it was for the ceramic cups. Sampling procedures were identical to determine whether the vending machine was contaminated by the ceramic cups.

Determination of contamination

To examine the potential for the hot beverage vending machine to become contaminated by the use of ceramic cups, the paper cup chute and cup guide, (Figure 2) were sampled with a sterile swab before and after each simulated day's use by either the contaminated ceramic cups or the paper cups. The swab was moistened in a tube containing 5 ml of nutrient broth. The surfaces of the paper cup chute and cup guide were swabbed thoroughly. The tip of the swab was returned to the tube and broken leaving the swab head in the tube. The tubes were refrigerated immediately at 5° C to prevent bacterial multiplication.

The tubes were removed from the refrigerator and vortexed for 10 seconds to mix. One ml of broth was then transferred to a sterile petri dish. Fifteen ml of sterile plate count agar was poured into the plate. The plate was gently swirled to mix and left standing at room temperature for fifteen minutes to harden. Then the plates were transferred to a 35° C incubator. After 48 hours of incubation the plates were examined for growth and colony counts were recorded.

To quantify the level of bacteria present on the paper cups and the contaminated ceramic cups introduced into the vending machine a sterile swab was used to culture each cup after it had cooled to an ambient temperature of 26° C. The swab was moistened in a tube containing 5 ml of nutrient broth. The inside rim of the cup was swabbed thoroughly,

the swab returned to the tube, and rinsed briefly. The same swab was used on the outside rim of the cup. The swab was returned to the same tube. A single tube of nutrient broth was used for each cup in order to determine individual growth. The tubes were refrigerated, vortexed, transferred to petri dishes, incubated at 35° C for 48 hours, examined for growth, and colony counts were recorded.

RESULTS

Phase one of the study examined the ability of the ceramic cups to support the presence of microbes after a hot beverage was added. Each cup was seeded with large numbers of organisms as described in materials and methods. The results are shown in Table 1. Significant survival of bacteria was observed with all dilutions used as controls and not having a hot beverage added, which indicate that a soiled ceramic cup could serve as a potential source of contamination. Adding hot beverage to the cup reduced survival in comparison to the controls by a range of 4% to 35%.

Table 1. Bacterial Dilutions and Survival

Dilution CFU's/ml	Organism Recovered Control**	Test A	Test B	Test C	Ave.	Survival* Percent
3000000	2275	560	490	490	513	27
1500000	1030	140	235	345	240	23
1000000	560	185	100	155	147	26
750000	330	140	110	95	115	35
600000	400	90	75	55	73	20
300000	160	5	15	0	7	4

*Determined by average organisms recovered from test A, B, and C divided by organisms recovered from the control for each dilution.

**Cup inoculated with organisms but no hot beverage added.

Phase two examined the potential for the vending machine to become contaminated by introducing ceramic cups seeded with known amounts of microbes. The cup chute and cup guide were sampled before and after each simulated day of low, medium, and high vending. Each ceramic cup was sampled after the hot beverage was added to establish the numbers of microbes present. Identical procedures were followed using unseeded paper cups as a control. Microbial growth from the cup chute and guide from both the experimental and control decreased (Tables 2,3), after each day's vending, with the exception of the control low volume vending day which had a slight increase.

Microbial growth was present on every ceramic cup after use in the vending machine with 86%, 81%, and 20% of the samples having greater than 100 colonies after low, medium, and high volume vending days respectively. Microbial growth in the controls was present in 57% in the low vending day samples, 45% in the medium vending day samples, and 26% in the high vending day samples.

DISCUSSION

This study indicates the use of personal cups in hot beverage vending machines are of low risk to the general public. Using the public health standard of greater than 100 colonies on the surface of utensils to establish the risk of the transmission of disease, the first phase of this study demonstrated that a dilution containing approximately 75 x 10^4 microbes per ml was necessary on the inside and outside lip surface of the cup to have this type of survival after exposure to a hot beverage. A personal cup with this level of contamination would have to have received little or no cleaning and a great deal of neglect prior to use.

Table 2. Cup Delivery Mechanism Contamination.

Volume Days and Cup Type	Before Dispensing CFU's/ml	After Dispensing CFU's/ml
Low - paper	55	85
Medium - paper	255	40
High - paper	120	35
Low - ceramic	45	35
Medium - ceramic	40	15
High - ceramic	20	5

Table 3. Summary of Cup Swab Organism Recovery in CFU's/ml.

Volume Days	Control	Average Recovery[a]	Range
Low - paper	5[b]	6.25	0 - 20
Medium - paper	0[b]	4.89	0 - 50
High - paper	5[b]	4.32	0 - 105
Low - ceramic	1105[c]	151.25	50 - 225
Medium - ceramic	735[c]	149.20	50 - 235
High - ceramic	355[c]	72.81	35 - 200

[a]Average recovery determined by swabs of seven cups per hour on a low volume day, forty eight cups per hour on a medium volume day, and ninety six cups per hour on a high volume day.
[b]Swab of paper cup not inoculated with organisms.
[c]Cup inoculated with organisms but no hot beverage added.

The second phase of the study indicated that even if the ceramic cups remained highly contaminated after a hot beverage was added, there was no increase of bacterial growth on the surfaces of the vending stage of the machine. The only occurrence of increased growth on the vending stage of the machine was the low volume day with the use of paper cups, which did not exceed the public health standard. Thus, the scenario of an individual introducing a contaminated ceramic cup into a vending machine, contaminating the vending stage, or the vending stage contaminating the cup of another user is not likely to occur.

It should be noted that microbial growth on the vending stage prior to dispensing paper cups on medium and high vending days was 255 and 120 colonies respectively. These high counts occurred when the vending machine was sampled on days when old equipment was removed and new equipment was installed in the laboratory at Illinois State University. It is believed that this activity contributed to increased microbial counts. Nevertheless, counts on the vending stage after dispensing the paper cups were consistent with other results in the study.

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One limitation of this study was its short duration. All the data collected were representative of a single day's use at either low, medium, or high volume. This provided no indication of how the use of contaminated ceramic cups would affect a hot beverage vending machine over an extended time period with varied intervals of maintenance and sanitation.

This study was not designed to determine the health implications of providing contaminated ceramic cups to individuals prior to use in the vending machine. The researchers involved in this study strongly recommend that ceramic cups for personal use should be washed frequently and used only by a single individual.

ACKNOWLEDGMENTS

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Deli Items May Dish Up Dose of *Listeria*

Reprinted from the FDA Consumer/July-August 1992, Pages 9-13

Some types of soft cheese, undercooked poultry, hot dogs not thoroughly reheated, food purchased from delicatessen, and other ready-to-eat foods are responsible for sporadic cases of listeriosis, mostly in pregnant women and people with suppressed immunity. The cases were identified by studies funded by the Food and Drug Administration and carried out by the national Centers for Disease Control from 1986 to 1990.

The cheeses found to contain the organism that causes the illness were mostly soft, white Mexican style (such as Queso Blanco and Queso Fresco). Past studies have implicated feta, Brie, Camembert, and blue-veined cheeses such as Roquefort. No problems have been found with hard cheeses, processed slices, cottage cheese, or yogurt.

Listeriosis is a food-borne illness that may cause few or no symptoms in healthy people but can cause serious illness in people with suppressed immune systems and the elderly. It can also harm the fetus and cause illness in newborns.

The illness is caused in humans by one species in a group of bacteria called *Listeria*. The name of this species is *Listeria monocytogenes*, which is often shortened, in common parlance, to "Listeria."

CDC had previously identified several outbreaks of listeriosis. But since most cases occur sporadically, research was needed to find out more about the role played by various foods.

The latest CDC study results were published in the April 15, 1992, *Journal of the American Medical Association*. CDC researchers confirmed 301 cases of listeriosis from November 1988 through December 1990 in California, Tennessee, Georgia, and Oklahoma. Though the rate of infection was low for the total population (7.4 cases per million), 23 percent of the infections were fatal.

Susceptibility and Symptoms

People most commonly contract listeriosis by eating food contaminated with the organisms, although the scientific literature contains a few isolated reports of occupational listeriosis (for example, farm workers and veterinarians who work with animals have developed minor skin infections).

Newborns and people over 60 have the highest incidence of listeriosis. One-third of infections occur during pregnancy and may lead to spontaneous abortion or serious illness in the newborn. Others most at risk include patients with immune systems compromised by cancer, AIDS, or immunosuppressive medications such as steroids and patients suffering from cirrhosis, diabetes, and ulcerative colitis.

The symptoms vary, depending on the individual's immune resistance. Symptoms may be limited to fever, fatigue, nausea, vomiting, and diarrhea, or these symptoms can progress to a more serious illness.

The more serious forms of listeriosis can result in meningitis (brain infection) and septicemia (bacteria in the bloodstream). Pregnant women may develop flu-like symptoms with complications resulting in miscarriage, stillbirth, or septicemia or meningitis in the newborn. In older children and adults, complications usually involve the central nervous system and bloodstream, but may include pneumonia and endocarditis (inflammation of the lining of the heart and valves). Skin contact with *L. monocytogenes* can cause localized abscesses or skin lesions.

It takes from one to six weeks for a serious case of listeriosis to develop, although flu-like symptoms may occur 12 hours after eating food contaminated with *L. monocytogenes*. Onset time probably depends on the patient's health, the strain of *L. monocytogenes*, and the dose — or amount of bacteria — ingested.

Outbreaks

Four reported outbreaks of listeriosis in North America in the past decade are either known or suspected to have been caused by *L. monocytogenes* in food.

- An outbreak in 1981 in Nova Scotia resulted in 41 cases of listeriosis, including 18 deaths; 83 percent of the cases were perinatal (occurring in infants near the time of birth). The outbreak was traced to *L. monocytogenes* on coleslaw that had been made from cabbage grown in a field fertilized with manure from *Listeria*-infected sheep.
- An outbreak in 1983 in Boston resulted in 49 cases of listeriosis, including 14 deaths; 14 percent were perinatal, the rest were adults with lowered immunity. Although pasteurized milk from *Listeria*-infected dairy cows was linked to the outbreak, *L. monocytogenes* was not found in the suspected brand of milk.
- An outbreak in 1985 in Los Angeles resulted in 142 cases of listeriosis, including 46 deaths; 85 percent were perinatal. The outbreak was traced to *L. monocytogenes* on soft, Mexican-style cheese manufactured with contaminated milk.
- An outbreak in Philadelphia in 1987 resulted in at least 32 cases of listeriosis, including 11 deaths. The source was never identified.

Researchers are not sure how many *L. monocytogenes* organisms it takes to cause illness. The infective "dose" varies, depending on the susceptibility of the individual. However, it is noteworthy that four of the ill persons in the

Los Angeles outbreak reported eating the implicated product (highly contaminated soft cheese) only once.

Thorough cooking will destroy *L. monocytogenes* on foods. Nonetheless, FDA and the U. S. Department of Agriculture's Food Safety and Inspection Services (FSIS) are working to reduce contamination of raw foods by *L. monocytogenes* and other potentially harmful bacteria.

From information gathered in its surveillance projects conducted in the 1980s, CDC estimates that about 1,850 cases of human listeriosis occur each year. The incidence, however, varies from state to state. CDC is encouraging state health departments to conduct surveillance programs for listeriosis so that outbreaks may be rapidly identified and investigated.

As the U.S. population ages and more people live longer with cancer and other illnesses that lower immunity, many experts believe the number of people at risk for listeriosis is likely to increase.

Surveillance data also indicate that each year about 425 U.S. deaths are related to *L. monocytogenes*. The probability of death varies greatly, depending on the patient's age and immunity. About 5 percent of the 9,000 food poisoning deaths each year are due to listeriosis.

Preliminary data suggest that the rate of listeriosis may have declined substantially during 1991 in several areas, perhaps related to intensified efforts to reduce *Listeria* contamination of foods.

Listeriosis can be positively diagnosed only by culturing the organism from blood or cerebrospinal fluid. Listeriosis can be treated with antibiotic drugs such as penicillin or ampicillin.

'Zero Tolerance'

Neither FSIS nor FDA will accept any detectable *L. monocytogenes* in cooked, ready-to-eat food. This is called a "zero tolerance" for the bacteria.

Both agencies have testing programs for *L. monocytogenes*. The goal of these programs is to help government and industry identify the causes of contamination in processing plants and make changes that will reduce *L. monocytogenes* contamination, prevent problems, and ensure a safe food supply. Both agencies can detain products at food processing plants, request a voluntary recall of products, or seize products through court order, if necessary.

Initially, FSIS regulatory testing programs included selected cooked meat products. Following a CDC report that traced the first case of listerial meningitis to incompletely heated turkey franks eaten by a cancer patient, FSIS expanded the *L. monocytogenes* monitoring program to further prevent the sale of any cooked and ready-to-eat foods or poultry products from which the bacteria are isolated. This included cooked sausages (including frankfurters and bologna), cooked roast beef, cooked corned beef, sliced canned ham, sliced canned luncheon meat, jerky, cooked poultry, and poultry and meat salads and spreads.

When *L. monocytogenes* is found in ready-to-eat meat or poultry products, the plant is notified and the product may be detained at the plant, voluntarily recalled, or seized by court order. From 1987 through March 1992, 27 FSIS-regulated cooked products from 27 firms were recalled, including frankfurters, bologna and other luncheon meat, chicken salad, ham salad, sausages, chicken, sliced turkey breast, and sliced roast beef.

FDA's monitoring programs first concentrated on cheese and dairy products, both domestic and imported. Later, the agency expanded coverage to include other ready-to-eat foods, such as sandwiches, prepared salads, and smoked fish. From 1987 to March 1992, 516 products from 105 firms were recalled.

Both agencies stepped up monitoring and surveillance programs for *L. monocytogenes*, and the food industry has also taken steps to control the organism.

Controlling *Listeria* in the Plant

FSIS and FDA have identified the Hazard Analysis and Critical Control Point (HACCP) system as the most effective strategy for controlling *L. monocytogenes* and other disease-causing bacteria on food products. In addition to encouraging adoption of this strategy by all who handle food, from farm worker to plant processor to consumer, the agencies are working with industry to design strong programs.

In an HACCP program, points at which food risks are more likely to be introduced are identified, and steps are taken to reduce the potential for consumption of unsafe products. For instance, because insufficient cooking of raw meat, poultry or milk may allow disease-causing bacteria to survive, the agencies require adequate cooking temperatures to destroy the bacteria.

The food industry, FSIS, and FDA have conducted workshops to develop recommendations for controlling risks at critical points. Government and industry, including food processors and grocers, are also working with retail establishments and hotels and other institutions to develop measures aimed at controlling the specific hazards identified.

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The Principles of Animal Testing

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Introduction

Animal testing forms the basis of most of the calculations on hazards and risks in our environment. Animals are chosen because of the obvious moral questions about feeding potentially toxic materials to humans. Usually the animal models for food additives are mice and rats but sometimes chick embryos, rabbits, dogs, monkeys, fish, nonhuman primates, and other species are used. Hopefully, most credibility would be given to experiments using animals that metabolize the test substance in a manner similar to humans, and also have a range of tissue and organ responses similar to humans.

Conventional Testing for Toxicity

When a food or chemical is fed to animals, the effects range from no observable response to beneficial effects, unfavorable results, or death, depending on the nature and quantity of the material ingested. The changes may be gross such as loss of weight or hair, or microscopic as indicated by examining tissues on slides under a microscope. There often may be changes in biochemical activity, such as enzyme action, observable only by chemical analysis.

Figure 1 shows a simplistic approach to animal feeding (Francis, 1986a). When dosage is plotted against response, usually a response above the zero dose is considered an adverse effect, whereas responses below the zero dose level are considered beneficial. In Figure 1A the compound has no observable effect on the response. Substances such as starch and sugar at reasonable doses would show this effect. There is a toxic effect for both sucrose and starch (the LD_{50} for male rats fed sucrose and starch is 42 g/kg body weight and 200 g/kg body weight/24 hours respectively) (Boyd, 1973). Death caused by sucrose was due to loss of control of bodily fluids and death from starch was due to gastric rupture. Experiments such as these normally are considered outside the realm of conventional toxicity testing. In Figure 1C there is a "threshold" dosage below which there is no observable adverse effect. A threshold exists because animals can detoxify, metabolize, or excrete quantities of almost any substance. At higher doses, the animals' ability to handle the compound is exceeded and a toxic effect is observed. Most compounds are in this category. In Figure 1B there is no threshold and even an infinitesimally small dose elicits an unfavorable response. Labelled by some as the "one-molecule" hypothesis, it has been argued by some scientists that a "one-hit," i.e., a single molecule change in DNA, is capable of creating a situation leading to the growth of a cancer. Another example of the no-threshold response is the effects of radiation. To a chemist, the one-hit theory is difficult to accept because of the size of Avogadro's number. There are 6×10^{23} molecules in every mole of a chemical. With this number of molecules, and their obvious ubiquity, one would expect considerable interaction. Ames and Gold (1990a) calculated DNA hits per day from an endogenous oxidant to be of the order of 10^5 for rats and 10^4 for humans. Thilly (1991), who believes that at least two genetic changes in a human cell are required before it becomes cancerous, estimated that at birth the human liver has already experienced 450 mutations in every gene. If this is true one has to wonder why cancer is not more prevalent. Also, recent evidence does not support the one-molecule theory. Scientists attempting to insert foreign genes into plant or animal tissue have found a surprisingly large DNase enzyme activity that rapidly removes foreign DNA, including damaged DNA. This is probably one of the most potent human repair mechanisms that mitigates against the one-molecule theory. The existence or nonexistence of the one-molecule theory is theoretically subject to experimental verification, but it probably never will be because of the infinitely large numbers of experimental animals required to test for the effects of infinitely small doses. In Figure 1D there is a range in which the addition of a chemical has a beneficial effect leading to an optimal level. As the dosage is increased a harmful effect is observed. Essential nutrients such as vitamins A and D and selenium are in this category but the classic example is oxygen.

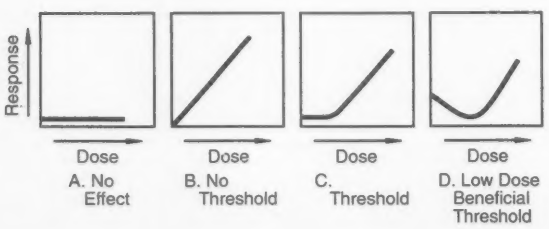

Figure 1. Four diagrammatic responses to a toxic chemical (Francis, 1986a).

The situation shown in Figure 1B is amplified in Figure 2 (Food Safety Council, 1982; Francis, 1986b). This illustrates a simplistic situation in which four levels (including zero) of a test substance are fed to rats, with the logarithmic dose plotted as the abscissa and response as the ordinate. The

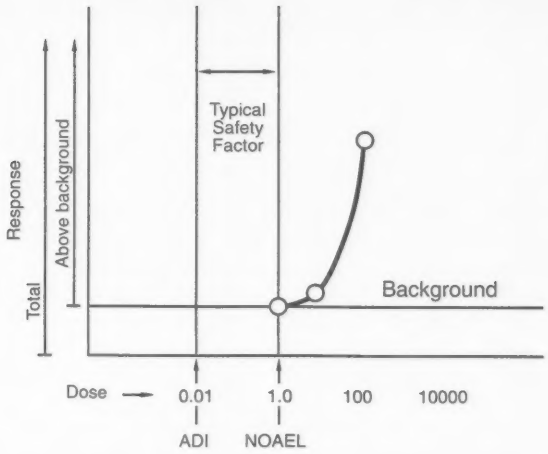

Figure 2. A simplified dose response experiment with an animal model (Food Safety Council, 1982). ADI = acceptable daily intake; NOAEL = no observed adverse--effect level.

first step is to determine the response above the base level. For example, with tumor production, there is a normal base level at which specific tumors develop regardless of the treatment. The response plus the normal base level is labelled in Figure 2 as the total response, sometimes called the Total Adverse Response (TAR). These data are very useful in determining the validity of an experiment because TAR values which differ significantly from normal laboratory experience are indications of problems with the experiments. The next step is to determine the maximum daily dose above the control at which the response is zero or the same as the control. In Figure 2 this is labelled as the no-observed-adverse-effect level (NOAEL) or the no-observed-effect level (NOEL), the no-affect level, or the threshold level. The NOEL is then divided by a safety factor to obtain the "acceptable daily intake" (ADI). The ADI is usually expressed as mg of the test substance per kg body weight per day. Expressing the ADI based on body weight minimizes the size differences between animals. Expressing the dose as mg per day minimizes the differences in life expectancy between animals.

The safety factor to calculate the ADI from the NOEL is usually understood to be 100. The rationale for using 100 is that humans may be 10 times more sensitive than rats, and humans themselves may vary in sensitivity by as much as 10 times. Thus, 10 x 10 = 100 (the 100-fold safety factor). Scheuplein (1989) pointed out that the 100-fold safety factor has to be tempered with judgement. For example, the 100-fold safety factor may not provide a high enough level for some nutrients needed to satisfy nutritional needs to maintain health. Toxicities for vitamins A and D, iron, and certain amino acids may be reached at levels less than 10 times higher than those recommended for optimum nutrition. Scheuplein also stated, "If frank teratogenic effects are observed and confirmed in a second study, judgement would be needed to decide if a larger safety factor should be considered. If the substance was not a carcinogen, the FDA would generally use a 1,000-fold safety factor as an additional margin to ensure against exposing consumers to levels of a chemical capable of producing irreversible developmental effects. If reversible developmental effects are seen, such as retarded skeletal and soft tissue development or decreased fetal weight, the FDA would apply the usual safety factor of 100." There is one more general step. The ADI is an amount but the allowable level in foods is a concentration. Therefore, the FDA has to estimate the probable intake of the food containing the additive and the data are used to calculate the acceptable level. If the quantity of the additive required for good manufacturing practice is lower than the ADI, the additive may be approved for other foods, at a later date, until the ADI is reached. This general approach to food safety testing has had good acceptance worldwide and it is generally believed to be a very successful approach. However, it is not applicable to carcinogens.

Bar (1991) commented that novel foods and other nontraditional substances that could be consumed in significant amounts by humans will require sophisticated safety testing and interpretation of results. Citing lactose and sugar alcohol as examples of secondary carcinogens, calculation of the ADI in the traditional manner is not possible since the usual 100-fold safety factor may not apply. The factor may be closer to one. "An integrated interpretation is required that takes results from nutritional, biochemical, endocrinological or food technology research into account, if needed."

Testing for Carcinogenicity

The 100-fold safety factor described in the preceding section is not suitable for carcinogens for three reasons. First, the order of magnitude is much greater—up to 5,000 instead of 100. Second, with humans, there could be a lag factor of 20 years or more. Third, some investigators do not believe that a threshold or tolerance level exists. In addition, five concepts introduce uncertainties into the calculations, namely: (1) choice of animal model, (2) mode of exposure, (3) level of dosage, (4) method of extrapolation from high doses to low doses, and (5) need for extrapolation of the data from animals to humans. Because of these uncertainties, the usual procedure in the past has been to adopt a very conservative approach, but all of the above assumptions have been severely criticized in recent years. The conservative approach may lead to serious economic impacts and this has been criticized by the federal Office of Management and Budget (OMB). The OMB (Anonymous, 1990) in an overview section of its regulatory program stated, "Conservatism in risk assessment distorts the regulatory priorities of the federal government, directing societal resources to reduce what are often trivial carcinogenic risks while failing to address more substantial threats to life and health."

The Animal Model

A standard bioassay is performed on both sexes of two species of animals at three dose levels plus a control. Thus, with 50 animals in each group of rats and mice, a total of 800 animals are required (Page, 1977). The whole procedure for testing and evaluation of one chemical takes up to three years at a cost of approximately $1,000,000 (American

Council on Science and Health, 1990). With only 800 animals, a relatively weak carcinogen may escape detection. A substance would have to induce cancer in 7 to 10% of the exposed animals in order for there to be a good chance of detecting carcinogenic action having statistical significance with a test of this size. Yet, 800 animals is probably the most that can be used because of the problems and expense in handling very large numbers of animals. Another concern is that even with the assumed close genetic relationship between rats and mice, they do not always react the same. Of the 190 chemicals tested on rats and mice by the National Cancer Institute (NCI), 98 were positive in at least one test species, and of the 98, 54 were positive in only one species (American Council on Science and Health, 1990).

When a given substance is being tested, usually an animal model that has the highest sensitivity to that particular substance is chosen. Yet even within one species, the strains may vary significantly. Wolff and Gaylor (1991) of the National Center for Toxicological Research reported that estimates of carcinogenic potency for 2-acetylaminofluorene (2-AAF) for four mouse hybrids varied by a factor of 2 to 6. They reported that the $B6C3F_1$ hybrid used by the National Toxicology Program generally showed the highest carcinogenic potency. With studies on dioxin, the guinea pig was chosen for prediction purposes because of its sensitivity to dioxin. The LD_{50} values were estimated to be, in terms of μg/kg body weight, one for the guinea pig, 45 for female rats, and 5,000 for hamsters respectively (American Council on Science and Health, 1991). The use of the most sensitive animal model shows a conservative bias in animal testing.

The Mode of Exposure

The preferred route of exposure is that which matches as closely as possible the route of human exposure, whether by ingestion of food or water, inhalation, skin, or injection. Chemicals may be injected by intramuscular, intraperitoneal, intravenous, or subcutaneous routes. Chemicals in solution can be painted on the skin, consumed in the diet or drinking water, or inhaled. If a substance is unpalatable it can be given by stomach tube. The administration of chemicals dissolved in corn oil and administered by gavage became suspect several years ago when more problems developed in control groups of rats getting oil without the test chemical as compared with control groups without the oil (Haseman et al., 1985). Historical review of the data indicated that mononuclear cell leukemia in untreated controls had increased from 10 in 1970 to about 50% in 1990, but, apparently the rate of increase is decreasing. Some investigators have attributed this and the reduced survival in long-term rodent studies to the use of "ad libitum" feeding with diets optimized for maximum growth. The elder rats simply get fat, which reduces their chances of survival. The overnutrition also increases their susceptibility to tumor formation. The growing problems of less than 50% survival and significant weight reduction in chemically dosed groups in over 50% of the chronic studies received the attention of the National Toxicology Program (NTP). Unfortunately the 1985 NTP "Workshop to Optimize Diets for Rodents in Chemical Carcinogenicity Studies" was never published. The present situation clearly overstates the risk so there is need for more research in this area.

The Level of Dosage

Usually the Maximum Tolerated Dose (MTI)) is used in animal experiments. The MTD is the largest dose that the animals can tolerate without endangering the health of the animals. The National Toxicology Program's Bioassay Program currently defines the MTD as the dose that creates no more than a 10% loss in body weight when compared with the controls. Often the MTD is one-half of the dose at which half of the animals die (the LD_{50}). Many animal experiments consist of three levels, zero (the control), the MTD, and one-half or one-quarter of the MTD. Ames and Gold (1990a,b) reported that more than half of the chemicals tested in rats and mice at the MTD have been found to be carcinogenic. Of the 427 chemicals tested in both species, 350 (82%) were synthetic industrial chemicals and about half (212/350) were classified as rodent carcinogens. About 77 natural chemicals have been tested in rats and mice of which about half (37/77) are rodent carcinogens. Ames and Gold think that this proportion is too high and may be due to the method of testing (Ames et al., 1990a,b; Marx, 1990).

It has been suggested that the high percentage of positives in the testing program was due to an intentional bias in the selection of compounds that have suspicious chemical structures. This may have been true earlier but lately the choice of chemicals for testing has been because of their wide industrial use— i.e., they were high-volume industrial chemicals, pesticides, food additives, dyes, or drugs (Gold et al., 1989a,b).

The use of the MTD in carcinogenic testing that evolved in the 1970s was based on three premises:

1. Only a small proportion of chemicals would have carcinogenic potential.
2. Testing at a high dose would not produce a carcinogenic effect unique to the high dose.
3. Chemical carcinogenesis would be explained by the mutagenic effect of chemicals.

Now, Ames and Gold (1990b) believe that all these assumptions are wrong. They postulate that administration of chemicals at the MTD increases cell division (mitogenesis). This increases the rate of cell mutation (mutagenesis) due to the increased rate of cell activity and, thus, increases carcinogenesis. They claim that any condition that causes cell death and subsequent cell division may predispose an animal to cancer. Examples are liver damage by alcohol, the effect of excess salt on stomach cancer, and chronic inflammation from exposure to asbestos or cigarette smoke. Chronic infections from viruses, bacteria, or schistosomes may cause cell death followed by mitogenesis. The human hepatitis B virus, a major cause of liver cancer, and the human papilloma virus 16, a major risk factor for cervical cancer, both cause cell proliferation. Hormones can cause mitogenesis and are well known as risk factors for breast and other cancers. There are many other examples.

The relationship between mutagenesis and mitogenesis has been used to support the above claims (Ames and Gold, 1990b). About 40% of chemicals that test positive at the

MTD level are not mutagenic in *Salmonella*. If mitogenesis itself is mutagenic, the non-mutagens are likely to be acting by this mechanism. Ames and Gold (1990b) state that in rodent cancer tests, mutagens are more likely to be (1) carcinogenic, (2) positive in both rats and mice, (3) toxic at lower doses and (4) the cause of tumors at multiple sites. The mitogenesis concept was confirmed in ingenious studies with pairs of mutagenic isomers such as 1-vs 2-nitropropane and 2,4-vs 2,6-diaminotoluene in which one was carcinogenic and the other was not. Although both are mutagenic only the carcinogen was mitogenic.

Huff and Haseman (1991) defended the use of the MTD: and lower levels in their studies with nearly 400 long-term rodent carcinogenic studies. In pesticide studies, 122 site-specific carcinogenic effects were observed for 31 positive chemicals. For 91% of these effects a numerical increase in these same tumor types was observed at exposure levels below the MTD. "Thus, not one of the 31 positive agrochemicals is a 'high dose only' carcinogen." Yet, in an assay with only an MTD and one or two lower levels, the dosage is still very high, possibly a thousand times higher than actual human exposures.

Clearly the levels of dosing will influence whether a compound is labelled a carcinogen or not. The use of the MTD is a conservative approach.

The Extrapolation from High to Low Doses

The use of high doses in testing for carcinogenicity has been the subject of much controversy but clearly there is no reasonable alternative. The argument is not with the use of animal doses higher than that which would be encountered by humans, but with the concept of how large should the experimental doses be. There is a real problem in designing experiments to detect cancers at a very low incidence. For example, with a U.S. population of 253,000,000 people, an increase of any event of 0.5% represents over 1,000,000 people. This is clearly unacceptable if the event is cancer. However, to identify with statistical confidence a 0.5% increase would require a minimum of 1,000 animals in a test group, assuming that no tumors were present in the control group (Klaassen and Eaton, 1991). If one wishes to decrease the odds, the number of animals required increases very rapidly. For example, suppose the upper limit, using the 90% confidence limits for a group of 1,000 animals yielding no tumors, was 2.3. To reduce the upper limit of risk to two tumors per one million at the confidence limit of 99.9% would require a negative result in a group of over 3 million animals (Lawrence, 1976). It is impractical to use groups of animals this large, so the alternative is to administer a larger dosage to obtain a response with a reasonable number of animals—i.e., 40 to 50 animals. The assumption is that the effects at the high doses can be extrapolated to very low doses. Conventional wisdom has been to draw a straight line from the last data point to the origin—the so-called linear extrapolation concept. However, evidence is accumulating that the effects at very low levels are not linear but are better explained with a curvilinear response. This produces a dosage effect curve that has been described as a "hockey-stick" shaped curve. Figure 3 is a diagrammatic representation (Food Safety Council, 1982). Clearly, an extrapolation from high to low doses is needed and the current controversies are concerned with how it should be done.

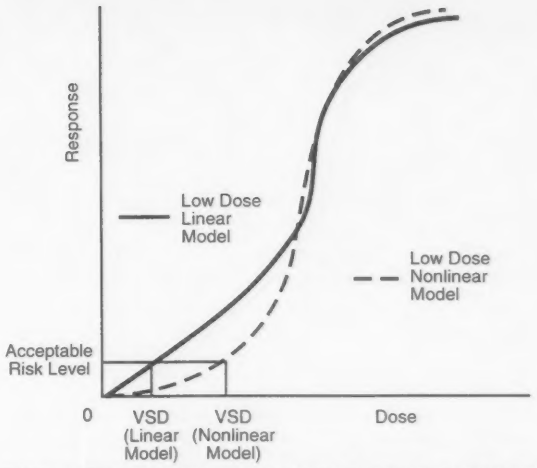

Figure 3. The calculation of the virtually safe dose (VSD) with a low-dose linear and a low-dose nonlinear mathematical model (Food Safety Council, 1982).

The main purpose of the extrapolation is to estimate a hazard related to the toxicity of a compound as determined by animal testing. "Hazard" has been used interchangeably with "risk" since both involve consideration of intrinsic toxicity and the circumstances specific to exposure. The process thus becomes "risk assessment." The National Academy of Sciences (National Research Council, 1983) has divided risk assessment into four major steps: (1) hazard identification, (2) dose-response assessment, (3) exposure assessment, and (4) risk characterization. Risk assessment is followed by risk management, which involves choosing the most appropriate public policy alternative for regulatory action.

The dose-response data can be used to determine the NOAEL as described previously or the lowest-observed-adverse-effect level (LOAEL). The difference between the NOAEL and the LOAEL will depend on the spacing and number of the doses. A number of mathematical models have been developed for extrapolation of the high to low doses (Table 1). The reader is referred to Klaassen and Eaton

Table 1. Models used in risk extrapolation (Klaassen and Eaton, 1991).

Statistical or distribution models	Log - probit Mantel-Bryan Logit Weibull
Mechanistic models	One-hit Gamma multihit (k-stage) Multistage (Armitage-Doll) Linearized multistage Stochastic two-stage (Moolgovkar-Venson-Knudsen)
Model enhancement	Physiologically based pharmacokinetics (PB-Pk) Time-to-tumor responses

(1991) for a detailed description. A number of mathematical terms for risk have been developed, but one, the "virtually safe dose" (VSD) seems to be gaining acceptance, possibly because it is easy to explain. The VSD represents the daily life-time dose that would yield a theoretical extra risk above the background risk of some "acceptable" level (often 1 in 1 million). By design, the calculation of the VSD is likely to result in a conservative estimate. Table 2 shows estimates of VSDs for five chemicals and four calculation models. Because the dosages vary considerably for each chemical, the VSDs are normalized to the value (one) for the One-Hit model for purposes of calculation. There is obviously a very large variation in VSD depending on the method of calculation. Of the 14 compounds listed by the Food Safety Council (1980), vinyl chloride is the only one that showed a Multi-Hit VSD lower than the One-Hit model. This effect of vinyl chloride was only evident when the highest dose level was considered. In another study Fumento (1990) quoted an 1980 Occupational Safety and Health Administration (OSHA) report as saying that saccharin ". . . shows a range of variation of more than five million-fold in estimates of human risk, although all the estimates were derived from the same set of experimental data on rats...."

Table 2. Differences in model-derived estimates of virtually safe doses (VSDs) at the 10-6 risk level, relative to the one-hit model (Food Safety Council, 1980).

Carcinogen	One-hit	Armitage-poll	Weibull	Multihit
Botulinum toxin Type A	1	1	50,000	150,000
Sodium saccharin	1	8,000	10,000	30,000
Aflatoxin	1	23	1,200	8,000
DDT	1	2	60	180
Vinylchloride	1	1	1×10^{-7}	2×10^{-8}

There is increasing evidence that the response at very low dosages is nonlinear. In one experiment, the so-called "megamouse" (Anonymous, 1980) or ED01 study, 24,000 female mice were fed a known carcinogen (2-AAF). The experiment was deliberately designed with enough animals to detect a 1% increase in the prevalence of tumors. The dose-response curve for liver cancer was equivocal since the curve was nearly linear down to the lowest level of AAF. In contrast, the curve for bladder cancer was definitely nonlinear. Cohen and Ellwein (1990) attributed the nonlinearity of this genotoxic carcinogen to a combination of carcinogenicity and cell proliferation.

A large double generation study on saccharin involving 2,500 second generation male rats was conducted by the International Research and Development Corp. (International Research and Development Corporation, 1983) to determine the shape of the dose-response curve. The incidence of cancers declined sharply with decreases in dosage, and the use of a linear model grossly overestimated the true risk of bladder tumors.

Recent reports on dioxin have supported the sigmoid-shaped response curve (Hansen, 1991b; Roberts, 1991 a,c). This was widely circulated by the news media because dioxin had the reputation of being the most potent carcinogen known. It was a contaminant present in the controversial agent—Agent Orange— used to defoliate the jungles in the Vietnam war. The active agents in Agent Orange were a mixture of 2,4-D and 2,4,5-T herbicides. In the absence of relative data on humans, the U.S. Environmental Protection Agency (EPA) assumed the worst and set the ADI at 0.006 picograms per kg body weight per day (one microgram = 1,000,000 picograms). Canada and the World Health Organization set the ADI at 10 picograms/day. Marilyn Fingerhut and coworkers (1991) at the National Institute for Occupational Safety and Health, in an exhaustive study of mortality records of all U.S. Workers exposed to dioxin from 1942 to 1984 proved that the response of tumor formation to dioxin concentration was indeed sigmoidal. Furthermore the risk estimates for dioxin at very low concentrations were indeed too high by a factor of 10. A reduction of 10 would remove the concern about the sub parts per trillion amounts of dioxin found in milk from contaminants in cardboard milk cartons. This finding spurred the EPA to search for a new model to predict cancer risk from dioxin (Hansen, 1991b; Roberts, 1991 b). Recent risk reevaluation (Keenan, 1991) produced a figure at least 16-fold lower than previous estimates. An examination of all the large dose-response studies on different chemicals completed by 1981 showed that 27 of the 31 studies indicated a sigmoidal shaped curve (American Council on Science and Health, 1990). More than one-third of the curves indicated that decreasing the dose by a factor of five would decrease the tumor risk by a factor of 25, not the 5 expected from a linear response.

Conventional wisdom indicates that tumor production in a multi-faceted phenomenon and only an understanding of the mechanisms will enable one to choose the appropriate model for dose extrapolation. The current linear extrapolation clearly is conservative.

Updates . . .

National Conference on Interstate Milk Shipments

The 1993 NCIMS will be meeting at the Sheraton Central Park Hotel, Arlington, TX, May 2-7, 1993.

The Conference Executive Board selected Dan Rackley, Oklahoma State Department of Health, Chair at their July meeting to replace retiring Chair, Al Place.

The time table for mailings to the 1991 attendees, state regulatory agencies and others on the general distribution list will be as follows:

First of December - notify state agency Commissioners/ Secretaries for the selection of state delegates.

Middle of December - General mailing including conference notification, problem submission forms, hotel registration forms and tentative program outline.

January 30 - Deadline for receipt of Constitution and Bylaw changes.

February 27 - Deadline for receipt of problems.

March 8-13 - Program Committee assigns problems to councils.

March 22-29 - Problem sets mailed to registrations.

April 10 - Deadline for receipt of pre-registration fees.

Registration fees have been set as follows:

	Pre-registration	At-the-Door
Regulatory/Academia	$200	$225
Industry	$250	$300

As in the past many problems will be dealt with which will continue to improve the quality of milk and milk products throughout the United States and Trust Territories. This enables us to continue to promote uniformity among regulatory agencies. Anyone interested in the objectives of the Conference is welcome to attend.

Additional information may be received by contacting:
Leon Townsend, Executive Secretary/Treasurer
National Conference on Interstate Milk Shipments
110 Tecumseh Trail
Frankfort, KY 40601
Telephone and/or FAX (502)695-0253

The following auditor's report is continued from "On My Mind", page 791.

IAMFES
FINANCIAL STATUS
JULY 1, 1991 to JUNE 30, 1992

Cash On Hand July 1, 1991		**$129,375**
INCOME:		
Advertising	$168,756	(18.64%)
Dues	221,079	(24.42%)
Journals & Booklets	364,187	(40.23%)
Annual Meeting (1991)	64,732	(7.15%)
Exhibits (1991)	64,552	(7.13%)
Administrative	15,723	(1.74%)
Lending Library	96	(0.01%)
Contributions	6,184	(0.68%)
TOTAL INCOME	$905,310	(100%)
EXPENSES:		
Salaries & Benefits	$290,544	(36.64%)
JFP Salaries	20,002	(2.52%)
Operations	48,801	(6.15%)
Miscellaneous	1,955	(0.25%)
Postage & Shipping	56,318	(7.10%)
Supplies	11,677	(1.47%)
Printing	195,554	(24.66%)
Telephone	15,482	(1.95%)
Advertising and Promo	5,025	(0.63%)
Travel	18,832	(2.38%)
Board & Committees	6,908	(0.87%)
Bank Fees	2,983	(0.38%)
Tapes (Lend. Library)	3,524	(0.44%)
Annual Meeting (1991)	88,261	(11.13%)
Exhibits (1991)	23,407	(2.95%)
Foundation Fund	1,929	(0.24%)
Small Equipment	1,672	(0.21%)
TOTAL EXPENSES	$792,876	(100%)
NET CASH FLOWS FROM OPERATIONS		$112,434
Large Equipment Purchases		(12,819)
Payment on Capital Lease		(2,468)
Due From Foundation Fund		(1,592)
CASH ON HAND JUNE 30, 1992		**$224,931**

News

Letter to the Editor

What a pleasant surprise on arriving home after a long vacation to find the award for outstanding environmental paper. It was indeed an honor and both Ken Welch and myself are most appreciative.

Please convey our thanks to the association.

Sincerely,
Lester Hankin
Connecticut Agriculture Experiment Station
New Haven, CT 06504

Conference for Food Protection Update

The Conference for Food Protection in Baltimore, MD, April 25-29, 1992 is now history. Over 160 participants including 34 delegates deliberated some 59 issues submitted by various Federal/State/Local Regulatory Agencies and the food industry.

Following is a summary of issues passed by the Assembly of Voting Delegates.

90-01-01/02/04/06

Salmonella enteritidis Subcommittee Report - Recommends USDA and Congress fund and develop a mandatory quality control program to monitor the safety of shell eggs at the farm and ask FDA to update its retail food code interpretation issued 8/22/90 and develop a fact sheet/brochure regarding S. e. and preventive action in conjunction with CFP's S. e. Subcommittee.

90-01-07/08/09

Bed and Breakfast Subcommittee Report - Asks FDA to serve as contact agency and liaison for AFDO and CFP on Bed and Breakfast issues and review AFDO model code (after consultation with AFDO) and CFP proposals to combine into one document.

90-01-16

Packaged Ice Subcommittee Report - Recommends CFP publish a news release regarding CFP 1990 recommendations.

90-01-20

Retail Meat & Poultry Processing Committee Report - Recommends CFP encourage FDA's rapid development of a national regulatory guideline.

90-01-26

Molluscan Shellfish Display Tank Committee Report - Recommends FDA issue an interpretation for their Program information. Manual based on the committee report.

90-01-28/35/36/40/41

Uniformity Committee Report - Referred proposed Uniform Criteria for Inspection Personnel to Accreditation Committee. Recommends Uniformity Committee be recharged to complete charge from '90 Conference.

90-01-30

Federal Food Service Subcommittee Report - Recommends notification of Secretary of HHS and Commissioner of Agriculture, FDA and Congress to give priority in funding food protection programs to address uniformity prevention/monitor foodborne illness.

90-01-32

Facility Plan Review Committee Report - Recommends continued endorsement of uniform plan review and continuation of the facility Plan Review Committee to develop standards and report to CFP at next meeting.

92-01-01 and 90-01-11

Exotic Animal Meat Sources - Recommends USDA and FDA work jointly with Committee to develop and define requirements for slaughter/processing; USDA and FDA evaluate guidelines developed by Unregulated Animal Food Sources Committee; and FDA and Committee survey states and act as clearinghouse for information and regulations.

92-01-0 (90-03-03/90-03-04)

Food Equipment Certification - Recommends ANSI add component to standards they use in certifying food equipment testing seeking universal acceptance of their mark/listing by food regulatory agencies; Specify equipment bearing ANSI logo be evaluated against government standards; Request ANSI seek CFP concurrence through CFP Committee and food regulatory agencies accept equipment listed by ANSI approved equipment certifiers.

92-01-03

Cooling of Potentially Hazardous Foods - Recommends FDA provide scientifically sound analysis supporting current requirement to cool potentially hazardous foods from 140 to 45 degrees F within 4 hours or its amendment and issue an interpretation within 6 months.

92-01-04 and 92-01-06

Unicode - Recommends FDA Commissioner facilitate the finalization of Unicode and involve the previously established Unicode Development Task Force in the process.

92-01-05

Food Equipment Certifications vs. Model Code Provisions - Recommends FDA advise food regulatory agencies and industry each time it determines that a new

process or equipment meets the intent of the model code even though it does not strictly meet traditional code provisions.

92-01-08

Retail Controls on Molluscan Shellfish - Recommends Conference Chair appoint a Committee to assist FDA in developing an interpretation that more clearly delineates how model code provisions should be applied to molluscan bivalve shellfish of retail.

92-01-09

Raw/Uncooked Seafood - Recommends regulatory agencies enforce FDA Interpretation 2-403 for dealing with raw products which will not be cooked and served ready-to-eat, such as sushi.

92-01-10

Prohibiting Hand-to-Food Contact - Recommends Council III form a Committee to review the epidemiological data relating to hand contact, etc. and make recommendations to Council I.

92-01-11

Sous Vide/Vacuum Packaging - Recommends FDA request manufacturers of vacuum packaging equipment and cook-chill systems supply purchasers at retail level with AFDO "Guidelines for Reduced Oxygen Packaging in Foods."

92-01-14

Single Service Articles - Recommends the resolution on "Single Service and Solid Waste," adopted by NEHA and IAMFES — urging caution in decision to curtail the use of single service articles — be endorsed and retitled by CFP as its own and copies sent to EPA Office of Solid Waste and others including state agencies.

92-01-16

Imported Food - Requests FDA and others provide technical/financial aids, i.e., training and increased contracts, to ports of entry in U. S. and Territories.

90-02-01

Education Committee Report - Recommends letters be sent to FDA, USDA, NMFS and DOE with 1990 Education Committee Report and requests these agencies meet to accomplish: Identification of existing program food safety training goals; Share action plans; Determine voids in food service education; and Coordinate future directions and share resources and avoid duplication of efforts.

90-02-07

Accreditation Committee Report - Recommends adoption of 11/25/91 report and approves the continuation of the Committee and asks for an action plan to be developed and submitted to Council II within one year, with the final plan to be submitted at the 1994 Conference. (Full report is available from Executive Office.)

90-02-20/33

Training, Testing and Certification Committee Report - Recommends Committee continue/complete original charge. Formal charges issued to Committee: Develop national standard for unit manager food safety knowledge; Define alternative means for managers to acquire food safety knowledge; Promote reciprocal acceptance of managers trained to national standards, by jurisdictions requiring foodservice manager training and certification. And recommends remaining charges from 1990 Conference be completed and provided to 1994 Conference. (Full report is available from Executive Office.)

92-02-01

MOU (with FDA) - Recommends adoption of MOU dated 1/28/92. (MOU is available from Executive Office.)

92-02-02

Joint CFP/ISSC Retail Seafood Committee - Supports continued efforts of joint committee and charges Committee with providing periodic reports to CFP for their Interim Reporting.

92-02-07

Food Safety Education in Schools - Recommends that educating school children on food safety and personal health/hygiene practices be a priority promoted by food safety regulatory and educational agencies and the food industry.

92-02-09

Federal Assistance to States for Program Development - Recommends FDA and USDA provide funding to state/local departments for development, implementation and evaluation of model retail programs.

92-02-11

Delegate Notification Mailing - Change Constitution and Bylaws, Art. IV, Sec. 5, Subsec. 33, "Each notice shall include Article II, Section 3 and Article XV, Section 5 of the Constitution and Bylaws."

92-02-15

Food Protection Program Information Clearinghouse - Recommends establishment of a clearinghouse for sharing of information on food protection programs sent to Education Committee.

92-02-17

Quality of Issues Submitted - Recommends Procedures Committee implement a quality assurance system to screen "unqualified issues."

92-01-155 (referred to Council II)

Immigrant Food Service Certification - Recommends promulgation of regulations requiring eating/drinking establishments be under supervision of resident managerial person who has passed written test for certification.

Referred issue to Ad Hoc Committee on Food Protection Management Certification.

92-03-08 (referred to Council II)

Health Risks Associated with Food Contaminants - Urges regulatory agencies, academia and industry to increase efforts to: Derive consensus as to relative risk of foodborne illness hazards/identify high risk food/ processes/behaviors; Develop layman's explanation of risk assessment process; and develop effective media communication to educate/inform public and media on the relative health risks associated with microorganism/ pesticide residues in foods.

92-03-01

Listeria monocytogenes Control - Recommends regulatory emphasis on refrigerated ready-to-eat foods implicated in illness caused by Listeria or demonstrated to support growth of Listeria; Food Code provisions be strictly enforced; Industry develop HACCP models for these foods; These foods be maintained at 40 degrees or less; and Food Codes be amended to require "open date coding" and the label statement *IMPORTANT* MUST BE KEPT REFRIGERATED

92-03-03

Code Dating of Wrapped Sandwiches - Recommends HACCP be applied to the production of wrapped ready-to-eat sandwiches, etc.; and food agencies amend their food codes to require "open date coding" and the label statement *IMPORTANT* MUST BE KEPT REFRIGERATED

92-03-04

Vibrio cholerae in Ocean-Going Vessels - Recommends issue be formally transmitted to Chair, Interstate Shellfish Sanitation Conference for their consideration at their July Conference.

92-03-05

Irradiation of Foods - Encourages use of food irradiation process where benefit to human health is real and significant. And recommends US participation in international efforts dealing with irradiation technology and consumer education. Encourages adequate funding to assure widespread dissemination of information.

92-03-09

Pesticides in foods (pesticide date program) - Recommends continued funding support for the USDA Pesticide Date Program and directs CFP Chair to promptly transmit recommendation to Secretary of Agriculture.

92-03-11

Ethnic Foods - Recommends uniformity in interpretation/enforcement of model food codes relative to the definition of potentially hazardous foods; encourages state food safety regulatory authorities to consult on complex issues with FDA; and FDA should make this information available through its FDA Prime Connection.

Resolutions Passed:

Resolves that the CFP urge the FDA/HHS to actively participate in international standard-setting activities focusing on harmonization of regulatory standards which can improve worldwide public health without compromising safety and efficacy standard.

CFP MEMBERSHIP

Future CFP Newsletters, Interim Committee Reports, Complete Council Reports and Meeting Announcements will only be mailed to 1992 Conference Attendees and Members.

Persons who did not attend the 1992 Conference or who have not otherwise paid their 1992-94 membership may join by paying a membership fee of $50 (which covers two years). Membership will entitle them to future newsletters, complete Council Reports, Interim Committee Reports, Meeting Announcements, etc.

Make checks payable to Conference for Food Protection and mail to Leon Townsend, CFP Executive Secretary, 110 Tecumseh Trail, Frankfort, KY 40601; telephone and/or FAX (502)695-0253.

First Recognition for Irradiated Food Testing

A test developed in Scotland to determine whether herbs and spices have been irradiated has become the first of its kind to be recognized for the irradiation of any type of food.

Irradiation of food, where ionizing radiation is used to destroy micro-organisms, was permitted in Britain by the 1990 Food Safety Act. Under current regulations, herbs and spices may be irradiated subject to licence conditions and explicit labelling. The irradiation of herbs and spices has been particularly attractive to food producers since these foods tend to carry a large population of microorganisms and are not readily treated by other means. It was quickly recognized, however, that a reliable test would be needed to establish whether or not food had been irradiated and correctly labelled.

The new thermoluminescence (TL) test was developed at the Scottish Universities Research and Reactor Centre (SURRC), a research department shared by the Scottish Universities of Glasgow, Edinburgh and Strathclyde.

Thermoluminescence testing involves extracting small quantities of silicates from the herb or spices. These are heated to 450 degrees C in a special "glow oven" which can record faint light emission (TL). The signals arise as a consequence of stored energy from the original radiation exposure.

Details of the test were first published in scientific papers in 1989 and foreign laboratories quickly reproduced the findings. European Community-sponsored tests last year involving a number of laboratories showed that they were all able to distinguish between irradiated and non-irradiated samples of herbs and spices. This

prompted the UK Ministry of Agriculture, Fisheries and Food (MAFF) to publish information on the tests for interested parties, including enforcement authorities. It is possible that this same procedure will be adopted throughout the EC.

There has already been considerable interest in the test from the food industry and the SURRC is currently offering a test service to public analysts and commercial companies. The research team is now concentrating on extending the test to fruit, vegetables and shellfish.

Science and Technology News.

USDA Gives Green Light to Irradiation of Poultry: AFFI Supports Decision

The American Frozen Food Institute (AFFI) applauds the U.S. Department of Agriculture (USDA) for its decision to approve the irradiation of poultry as a means of destroying potential bacteria that can cause foodborne illness.

"Thirty-five countries around the world currently use irradiation to eliminate or reduce pathogenic and spoilage microorganisms, control insects and delay ripening," said AFFI President Steven C. Anderson. "We are pleased that USDA sees the benefits of controlled irradiation, including reduced health care costs and an extended shelf-life for many products."

The new rule specifies that future poultry irradiation facilities will be inspected by USDA's Food Safety and Inspection Service. The words "Treated with Radiation" or "Treated by Irradiation" will be printed prominently on the package label of irradiated poultry. Currently, there are no facilities conducting poultry irradiation in the U.S.

AFFI submitted comments on the use of irradiation to USDA in June. In the comments, Anderson noted that at a recent meeting of the World Health Organization in Geneva, food safety specialists concluded that "food irradiation up to a certain level presents no toxic danger."

AFFI believes that irradiation of food does not impact its nutritional qualities. "Macronutrients, including proteins, fats and carbohydrates, remain unchanged. Micronutrients, such as minerals, are not diminished by irradiation," stated Anderson.

Presently, in the United States, fresh fruits and vegetables, wheat, dehydrated or dry spices, and some dehydrated or dry enzyme preparations have been cleared for irradiation by the FDA. USDA only permits the irradiation of pork for the control of trichinosis.

AFFI is the national trade association that has represented the frozen food industry for 50 years. Its members produce over 90 percent of frozen food processed in the United States.

For more information contact Traci Carneal at (703)821-0770.

Panelists say International Harmonization is not a Threat to U.S. Food Safety Standards

Although some consumer groups believe that U.S. food safety standards will be compromised if international harmonization efforts are successful, a panel of experts from government, industry and consumer organizations recently refuted that allegation.

Speaking at a Sept. 16 meeting on food safety issues in animal agriculture — a project of the AHI Food Safety Network — were John Augsburg, D.V.M., who represented the Food and Drug Administration's Center for Veterinary Medicine; Lester Crawford, D.V.M., Ph.D., executive vice president for scientific affairs at the National Food Processors Association, Paul Drazek, assistant director of the national affairs division for the American Farm Bureau Federation, and Mark Silbergeld, director of the Washington office of Consumers Union.

The panelists discussed the U.S. government's efforts with other nations and global agencies toward international harmonization of food standards. Such standards are considered necessary for the workings of the General Agreement on Tariffs and Trade and the North American Free Trade Agreement, if expanded trade opportunities and an objective marketplace are truly to be created. Others are concerned that international harmonization could mean that food safety will be determined by politics rather than science, or that standards will be lowered.

All speakers at the AHI meeting said the key to harmonization lies in objective, science-based food safety decisions by the Codex Alimentarius Commission, a United Nations-funded global body. Under the terms of the trade agreements, Codex-developed standards for food safety could be used on an international basis. Standards for the international use of animal health products would come from Codex.

Because Codex has not proven to be completely science-based, many worry that it cannot be the objective source of food safety standards. All speakers at the AHI meeting, however, said food safety would not be compromised. According to FDA's Augsburg, international harmonization efforts specifically state that any country's food safety regulations are allowable — even if they are more stringent than international standards — if they are based on sound science.

Augsburg said FDA is now finalizing a report on international harmonization which will reiterate the need for sound science to be the ruling principle in all harmonization discussions.

NFPA's Crawford agreed that the idea of decreased consumer protection under international harmonization is a myth. "No trade agreement or harmonization initiative can change a U.S. food safety regulation," he said. "This has been debated in Congress and is totally false. No standards will take the place of existing food safety standards."

AFBF's Drazek pointed out that part of the reason international harmonization efforts have faced criticism is because Codex has a reputation as a "secret society" that withholds information. This isn't true, he said, and pointed out that all Codex activities are widely reported in the press.

"What harmonization does," Drazek said, "is increase the information flow around the world. If all countries know and understand the food standards that developed nations have agreed to, then food safety around the world would increase."

Speaking for the Consumers Union, Silbergeld also said that it's important to remember that harmonization is voluntary, and does not change existing standards, laws or regulations.

While Consumers Union has not taken an official position on GATT or NAFTA, it has been vocal on trade issues, despite criticism from some other consumer organizations.

"Consumers Union has always supported international trade because good trade environments affect the price of food — and that in itself is a health issue," Silbergeld said. "International harmonization will help that, and Consumers Union believes agreements like GATT and NAFTA effectively preserve U.S. food safety standards."

AHI represents manufacturers of animal health products — the pharmaceuticals, vaccines and feed additives used in modern food production, and the medicines that keep pets healthy.

For more information contact AHI, 119 Oronoco Street, Alexandria, VA 22314-2058, Phone (703)684-0011, FAX (703)684-0125.

NCSU Scientist Makes Trap for Viruses that Cause Milk to Spoil in Cultured Products

Powerful, new viruses are churning out trouble in the nation's dairy industry. Instead of tasty cheese and yogurt, the nation's dairy processors are finding some of their vats full of spoiled milk.

With the viruses currently spoiling about 7 percent of the nation's cultured milk, a food scientist at North Carolina State University says that dairy forces must fight back.

Their weapon? Biotechnology.

Dr. Todd R. Klaenhammer, William Neal Reynolds Professor of food science and microbiology at NCSU, has developed a genetic defense for the tiny-but-precious bacteria that ferment milk to make cheese and other cultured milk products.

The new viruses target and kill these useful bacteria before they can complete their job of fermentation. As a result, the milk spoils.

The defense, on which Klaenhammer is seeking a patent, would create several strains of bacteria that resist the viruses in different ways. The strains would be rotated, constantly surprising a virus so that it can't evolve a counter-defense.

The development will be useful in other industries that rely on fermentation, including producers of wine, pickles, solvents and even some pharmaceutical products. Those industries use bacteria that are subject to the viral attacks.

"The strategy would be applicable to any fermentation system you have," Klaenhammer said. "It will allow industries to put their highest quality bacteria into continuous production."

The viruses, which attack bacteria but not people, complicate an already grim picture for the tiny lactic acid bacteria used to ferment milk. The bacteria are selected and developed carefully for their ability to produce a flavor that is just right for cheese or yogurt consumers, but they're in short supply.

"The fact is that we don't have enough organisms in the world to fulfill the demand for cultured milk products," Klaenhammer said. "So the virus, called a phage, really makes matters worse for dairy processors."

Klaenhammer's defense system rose in part out of 1985 advances he made using gene transfer techniques. Klaenhammer succeeded in passing bits of genetic material coded for "phage" resistance, called plasmids, from one bacterial cell to another through a natural mating process.

The step created a strain of bacteria that resisted viral attack, and his technique was widely adopted in the dairy industry and in others reliant on fermentation.

However, three years later Klaenhammer found that the viruses had mutated into new viruses, the ones dairy producers are facing today, that could get around the bacteria's resistance. As a result, once again dairy processors have suffered huge losses to viral attacks.

But Klaenhammer refused to be outsmarted by a submicroscopic germ. He studied the dynamic between the bacteria and its rival virus in search of a clue to building a once-and-for-all trap.

The clue he found lay deep in the plasmids that contain genetic material coded for the viral resistance. Klaenhammer found that two major enzyme systems work together to defend the bacteria.

One system generally inhibits the virus by causing the bacterial cell to commit suicide. The other cuts the genetic sequence of the viral DNA to keep it from replicating. Most important, each system has many different varieties.

Now using recombinant, or gene-splicing, techniques, Klaenhammer's new defense combines the enzyme systems in many variations and creates a number of genetically resistant strains of bacteria. These different strains are rotated so that the virus never knows which kind of resistance it will be up against next. The system undermines the virus's ability to learn and adapt from past experience.

"We assume that the phage will always try to catch up because of evolution," Klaenhammer said. "But we want to make it so complicated that it becomes impossible for the phage to ever catch up."

This research, a project in the Southeast Dairy Foods Research Center based at NCSU, is funded by Haarmann & Reimer Corp. and Marschall Products of Rhone-Poulenc Inc.

Klaenhammer expects the process to be commercialized in six months to two years.

"With the recent FDA ruling allowing the sale of genetically engineered tomatoes, the door is beginning to open to other genetically improved foods," he said. "With genetic technologies, the opportunities to expand and improve our food supply are tremendous and that includes fermented foods that will be improved by this new process."

For more information contact Lucy Coulbourn, Director, NCSU Information Services, Box 75504, Raleigh, NC 27695, (919)515-3470.

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Seminar Covers Basics for Food Plant Sanitarians

The 1993 Basic Food Processing Sanitation Course of the American Institute of Baking will feature the essential elements needed to develop and maintain today's modern food product safety programs.

Conducted in Manhattan, Kansas, January 25-28, the seminar will include management principles, developing sanitation programs, quality assurance, pest identification and control, microbiology, molds and their control, chemistry of detergents and sanitizers, pesticides, and a how-to session dedicated to helping create or fine-tune an effective training program.

Some specific subjects covered will be a thorough update on food product safety, how to staff and plan a sanitation program, avoiding dust explosions, updates on pesticide and chemical safety, how to handle regulatory inspections, and food plant microbiology basics.

"Both food processors and millers will receive specialized instruction relating to their work environments," William Pursley, vice president sanitation at AIB explained. "Food processors can expect to receive detailed information describing proper methods and procedures for cleaning production equipment. Cereal processors will focus on sanitation and its relationship to dust explosions, along with mill and elevator fumigation and safety."

Participants will receive numerous handouts provided by course speakers as well as the AIB Basic Sanitation Manual, Food Processing Consolidation Standards, forms, USDA Handbook #500, and workbooks. These will provide excellent reference material.

Tuition fees are $525 per participant from companies who are members of the Institute and $575 for non-members. For further information write to the Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, Kansas 66502 or call (913)537-4750 or (800)633-5137.

Food and Environmental Hazards to Health

Outbreak of Type E Botulism Associated with an Uneviscerated, Salt-Cured Fish Product — New Jersey, 1992

In May 1992, the New Jersey Department of Health (NJDH) received a report of a man admitted to a hospital with a preliminary diagnosis of botulism. Subsequently, three family members of the man were diagnosed with botulism. This report summarizes the epidemiologic investigation of these cases that linked illness to consumption of an uneviscerated, salt-cured fish product.

During May 5, a man of Egyptian descent aged 32 years made three visits to a hospital emergency department because of rapidly progressive problems including dizziness, ptosis, facial drooping, dry mouth, weakness, and respiratory failure requiring mechanical ventilation. On the third visit, myasthenia gravis was diagnosed on the basis of a positive Tensilon* test. On May 6, the patient was transferred to another hospital for treatment of suspected myasthenia gravis; on arrival, he was admitted to intensive care and continued on mechanical ventilation for respiratory failure. Plasmapheresis was performed without improvement in symptoms.

Also on May 6, three family members developed blurred vision, ptosis, and dry mouth. A diagnosis of botulism was considered, and the three family members were hospitalized. All four patients received trivalent (types A, B, and E) botulinal antitoxin.

NJDH traced the source of botulism to an ethnic preparation of fish known as moloha, an uneviscerated, salt-cured fish product. On May 3, the family consumed moloha reported to have been purchased that day from a local retail fish market. They consumed the moloha without cooking or heating it. Botulinal toxin type E was detected in leftover fish and in a stool specimen from the index patient. A family friend who also ate some of the fish but did not develop symptoms was treated with antitoxin as a prophylactic measure.

On May 6, no moloha or similar fish products were found at the market, and the owner denied selling this type of fish. The fish distributors serving this market were contacted, but no source of the fish could be identified.

On May 7, NJDH notified all New Jersey acute-care hospitals, public health departments in the New Jersey and New York City areas, and the New Jersey Poison Information and Education System of the outbreak and signs and symptoms of botulism. On May 8, the public was alerted through the news media to avoid consumption of moloha and to seek medical care if symptoms of botulism developed. CDC notified state epidemiologists of nearby states of the outbreak. No additional cases were identified.

Use of trade names is for identification only and does not imply endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

Editorial Note: Foodborne botulism is a paralytic illness caused by ingestion of a preformed neurotoxin in contaminated food. Patients typically develop cranial nerve palsies followed by descending paralysis that can lead to respiratory failure and death. Of the seven toxin types, three (A, B, and E) account for virtually all cases of botulism in humans. Type E is associated with preserved or fermented fish and marine mammals, and ethnic preparations of uneviscerated fish pickled in brine have previously been associated with type E botulism.

Treatment for botulism usually requires intensive care, including mechanical ventilation; the early administration of antitoxin is recommended. Physicians who suspect botulism should contact their state health departments immediately for assistance with diagnosis and treatment. State health departments can contact CDC to obtain antitoxin and further assistance.

MMWR 7/24/92

Cercarial Dermatitis Outbreak at a State Park — Delaware, 1991

On October 28, 1991, an employee of the Division of Public Health (DPH), Delaware Department of Health and Social Services, reported that her son and at least 10 other persons who had recently participated in a high school biology class field trip to Cape Henlopen State Park had contracted pruritic dermatitis. The Delaware Health Monitoring and Program Consultation Section conducted an investigation to confirm the reported presumptive diagnosis of cercarial dermatitis and to assess the extent of this outbreak.

On October 19, 1991, 37 students aged 13-16 years (median: 14.6 years) and their teacher spent 1.2-6.0 hours (median: 2.8 hours) wading at low tide in a shellfishing area. The weather was sunny and unseasonably warm; the air temperature was 80°F (27°C), the highest recorded in October 1991. During October 20-28, 29 students developed pruritic dermatitis; 11 visited their physicians for treatment.

On November 7, all of the students and their teacher were examined and interviewed by staff from the DPH. A case was defined as pruritic papular or papulovesicular dermatitis that developed in a person 12 hours after seawater exposure. Of 37 (97%) persons who had had contact with seawater, 30 (81%) met the case definition. Lesions were restricted to the parts of the body exposed to seawater (i.e., legs, arms, and abdomen); the incubation period ranged from 14 hours to 14 days. Pustules on four persons represented secondary bacterial infections that probably resulted from scratching of vesicles.

Cases occurred among five of 11 persons who wore long pants, compared with 25 (96%) of 26 who wore shorts (relative risk = 0.5; 95% confidence interval = 0.3-0.9). Promptly drying the skin with a towel did not alter the risk

for dermatitis. The only person who was not exposed to seawater did not develop dermatitis.

Two persons were treated with oral prednisone; in one, manifestations recurred after completion of a 1-week course, indicating persistence of cercarial antigen in the skin.

On November 7 and 8, mud flat snails (*Nassarius obsoletus*) were collected from the site of the field trip. Snails were isolated in culture dishes and examined after 24 hours for the presence of released cercariae. Two specimens of a brevifurcate apharyngeate cercaria were found in a dish containing two snails. Their morphology was consistent with *Microbilharzia variglandis*, an avian schistosome implicated as a causative agent of cercarial dermatitis. Shedding of *M. variglandis* was not observed in 936 snails examined at CDC. An additional 300 snails were then crushed and examined for trematode infections; two (0.7%) were infected with *M. variglandis*, each with more than 1000 mature cercariae and other cercariae in various stages of development.

Although 10 other groups were identified who had exposure to seawater at the same location during August 8 - October 31, 1991, none reported illness. Two of 18 physicians who were contacted in Kent and Sussex counties reported having diagnosed and/or treated 12 cases during 1991 that were not related to this outbreak; however, the location of exposure to seawater was unknown for these patients.

The DPH recommended to park officials that they advise persons wading in the shellfishing area to wear protective clothing (e.g., long pants, hip boots, and waders) and that this advisory should remain in effect until December 31, when cold water temperatures would reduce unprotected water contacts.

Editorial Note: Cercarial dermatitis (i.e., swimmer's itch) is a cutaneous inflammatory response associated with penetration of the skin by cercariae, the free-swimming larval stage of bird schistosomes. Cercarial dermatitis can occur worldwide; in North America, cases have been reported from numerous localities in the United States, Canada, and Mexico. The distinct aspects of cercarial-induced dermatitis that differentiate it from a dermatitis of bacterial etiology were observed in this park-associated outbreak. Symptoms include reddening and itching of exposed skin in the water or immediately after emerging, indicating initial penetration of cercariae through the skin, and delayed onset of pruritic raised papules that may become vesicular.

Typically, hosts of avian schistosomes are migratory waterbirds, including shore-birds, ducks, and geese. Adult worms found in the blood vessels of the avian hosts produce eggs that are passed in feces. On exposure to water, the eggs hatch and liberate a miracidium that infects a suitable molluscan intermediate host. The parasite develops in the snail to produce cercariae that are released under appropriate conditions and penetrate the skin of birds to complete the cycle. Humans are inadvertent hosts; cercariae penetrate the skin but do not develop further. A number of species of dermatitis-producing cercariae have been described from both freshwater and saltwater environments, and exposure to either type of cercariae will sensitize persons to both.

Previous contact with cercariae leads to a more immediate and intense immune response. This sensitization phenomenon explains the wide range of incubation periods reported in cercarial dermatitis outbreaks. Symptomatic treatment of the dermatitis includes antihistaminic and antipruritic topical medications.

In this investigation, the low infection rate of *M. variglandis* in the mud-flat snails suggests few snails were infected as a result of the fall bird migration. However, trematode life cycles of the type exemplified by *M. variglandis* include amplification of parasite larvae in the snail host that results in the release of thousands of cercariae from a single snail on a daily basis.

Environmental conditions reported to be associated with shedding of *M. variglandis* include low tide, calm water, and sunny weather during the colder months of the year. The mechanism by which these conditions trigger release of cercariae of *M. variglandis* from infected snails is not well understood; however, all these conditions were present at the time of the Delaware outbreak.

Focal mollusciciding, an established control measure in freshwater, is not effective in marine settings that are subject to wave action and/or tidal movement. Control and prevention of this condition in marine environments involve recognizing areas in which dermatitis-producing cercariae may be encountered. Although the Delaware outbreak appears to have been restricted to a limited area, outbreaks can occur over larger areas, such as one that occurred on the southwestern shore of Connecticut in September 1983 (Connecticut State Department of Health Services, unpublished data, 1983).

Outbreaks of cercarial dermatitis occur unpredictably, and routine surveillance for cases and outbreaks is impracticable. A timely public health response depends on early recognition of cases by local physicians who diagnose or suspect cercarial dermatitis. Appropriate preventive measures include the posting of signs that warn of the risk for contracting cercarial dermatitis in the affected area and recommendations to curtail water-related activities and wear protective clothing.

MMWR 4/10/92

Sanitary Design

A Mind Set

Donald J. Graham
Senior Food Technologist
Sverdrup Corporation
St. Louis, MO

CHECKLIST - PART 2 (Continued)

Part 1 of the Checklist was printed in Dairy, Food and Environmental Sanitation, October, 1992, pages 689-691.

Evaluating an existing facility helps its manager determine where the plant fits in the pattern of sanitary design. In the last issue, the first seven items in part two of a four-part checklist were discussed. This article focuses on the remaining seven items that must be taken into consideration when evaluating existing facilities in terms of sanitary design.

8. Does the landscaping avoid creating harborages and attractions for insects, birds and rodents?

A food processing plant surrounded by neat, well kept lawns, nicely trimmed hedges and trees creates a favorable impression on the public, employees and regulatory inspectors. If, however, the architect that designed the grounds was unaware of certain design precautions that discourage unwanted pests from making a home in the otherwise attractive landscaping, a number of infestation problems are created for the plant sanitarian.

- Roads and parking lots should be paved, sloped and drained to avoid the creation of dust when delivery or shipping trucks enter the grounds. Dust carries all kinds of microorganisms that can be carried into the process areas and contaminate product.
- All low spots in the paved areas should be filled, causing rain water to run off into a water disposal system and prevent it from collecting and standing. These puddles become both watering places for rodents and breeding grounds for any number of insects.
- Grassy areas should be well mowed and separated from the buildings outside wall by a 30-inch wide strip of pea gravel. This pea gravel should be 3- to 4-inches deep spread over a layer of heavy duty plastic. Pea gravel does not bridge preventing the rodents from tunnelling through it. The heavy duty plastic prevents weeds from growing up through the stones.
- This 30-inch strip of clear are provides an open place that discourages rodents from entering as they usually prefer to remain hidden in long grass or weeds. The pea gravel also discourages them from trying to burrow under the outside wall of the plant.

Landscape designers often put hedges along the wall of the building facing "public" areas such as the parking lot or nearby streets. The use of hedges is fine as long as they are placed correctly. No hedge should be placed closer than 30 feet to the building. Trees are included in the 30-foot rule. A 30-foot clear area makes it more difficult for rodents and other animals living and nesting the shrubbery to gain access to the plant or to burrow under the walls or slab. Trees should be selected from among those that are not especially attractive to birds for nesting or roosting.

9. Is there exposed piping over the product stream?

Exposed piping in a food processing area can become a source of contamination to products or to product contact surfaces below it. If condensate forms on the overhead pipes and drips onto the product, then it contributes to contamination and the pipe becomes a product contact surface according to the definition found in the Food and Drug Regulations, 21 CFR part 110. Product contact surfaces must meet the criteria of being non-toxic, non-reactive and non-corrosive to the product and must be cleanable. If Listeria is a problem in the plant, a good place to look for it - and to eliminate it is in condensate on pipelines.

Pipes are inevitably leak. It becomes a very expensive leak when it occurs over a batch of product and production has to be stopped, contaminated product discarded and the product contact surfaces cleaned and sanitized. Plus the leaking pipe must be repaired before production resumes. Keep pipelines away from areas over open product or product contact surfaces.

10. Do sewer lines run over process areas, raw material, ingredient and/or finished goods area?

It is even more important to keep sewer lines from passing over any area involving ingredients or processing.

This includes process waste lines, floor drain lines from above-grade floors, mezzanines or balconies, roof drain lines and especially sanitary sewage lines. These lines should not be run over the processing floors, the raw materials and ingredients storage areas and the finished goods storage areas. Incorrectly placed wastelines present a real source of contamination potential. It is a given that pipes leak at one time or another, and if they are hung over any of the areas described above then have a plan ready for discarding product due to contamination.

11. Does the roof over the processing areas have a smooth nongravel surface to permit cleaning?

Many older food processing plants have a tar/gravel roof over all areas of the plant. These were the accepted roofs and served a number of purposes. However today we are not recommending this type of roof, especially over the processing areas. Particles from the processing areas get onto the roof through the roof exhaust ducts and settle down into the spaces between the stones and are impossible to clean out. I have seen a number of roofs where grain and seeds have lodged in the gravel and were growing. Contaminants with a high level of fat can become lodged in the stones and turn rancid, emitting a bad odor which then can reenter the plant through the air intakes. The same is true for product that can support growth on the roof. The bacteria, yeast and mold can reenter the plant through the air intakes and contaminate the products in process.

The recommended roof coverings are smooth membrane-type that can be washed down or swept. They also do not hold moisture which allows microorganisms to gain a foothold.

12. Is the incoming air filtered to avoid contamination of the product stream?

The FDA has stated that air is considered a major source of product contamination by microorganisms. These microorganisms can exist in the air on dust particles, in or on moisture droplets (aerosols) or as isolated vegetative cells or spores. Older plants are far from being air tight. If the processing area have negative air pressure, then they can suck in all of the organisms capable of contaminating the food products, ingredients or materials. Incoming air needs to be filtered. The sensitivity of the product being processed dictates the degree of filtration required. Some processing plants are located in areas where a high degree of filtration is required. Some processing plants are located in areas where a high degree of filtration is required. Being downwind of a municipal sewage treatment plant requires good filtration. Municipal plants usually have tertiary treatment, and the wind picks up the bacteria in the moisture droplets and spreads them downwind into your plant's air intake. Feedlots are another source of airborne bacteria carried by the wind. Particles contain large numbers of bacteria from dried fecal material.

Some very good filter systems are available on the market today. Every plant has to assess the degree of filtration required based on the sensitivity of the product or products and the surrounding sources of potential contamination. Many plants do not use 100% makeup air for the in-plant air circulation. Recirculated air should be filtered to remove any odors generated in the process area, any air-borne bacteria generated within the facility and any dust or dirt particles generated during the processing steps. Air within a plant can be one of the biggest sources of potential contamination and is often overlooked.

13. Are there correctly designed handwashing stations in your process area?

All food processing plants should have correctly designed handwashing stations not only in the restrooms and locker rooms but in the processing areas too. Employees have no excuse for not washing their hands after using the restrooms, or when on the processing floor after handling equipment or blowing their nose. They must wash their hands after using the restrooms, or when on the processing floor after handling equipment or blowing their nose. They must wash their hands before handling the food products again. These hand-washing stations should be either foot, knee or thigh operated. They should not have handles that have to be touched after hands have been washed. There should be an adequate supply of soap, warm water and paper hand towels along with an adequate used towel disposal container. Many diseases can be and are passed on through food products by unclean hands of employees. Foodborne illnesses such as Hepatitis A, Salmonellosis, Listeriosis, Staph., and others too numerous to mention here have been proven to be transmitted through food.

One company, Meritech, is now marketing an automatic hand washing and sanitizing device that eliminates the old hand dip stations used in food plants where handling and inspection of product by employees on an inspection belt or other processing line occurs. The employee merely places his hands inside the compartments and an electric eye senses his presence. It turns on a gentle spray of warm soap and water and washes the hands. It then sprays them with a sanitizer. All the employee has to do is to dry his hands on a paper towel. The equipment is expensive but from all reports does a very good job of sanitizing.

14. Have the details of your design been checked against applicable government regulations by a competent engineer?

The USDA's Handbook 570 requires the use of "a competent engineer" to draw up plans and designs for a USDA inspected plant. The use of a competent engineer or architect trained in sanitary design is always a good idea when designing or renovating a food processing plant of any king. They design sanitation into the facility and prevent it from being a costly afterthought once the walls are going up, the floor is being laid or the equipment is being installed. With the correct mind set, the engineer is thinking about sanitary design when the time pencil is first put to the paper until the time the facility starts producing product.

The next installment discusses part 3 of the checklist which covers walls, floors and ceilings.

Federal Register

Food Safety and Inspection Service

Prominently Disclosed Product Name Qualifiers

Agency: Food Safety and Inspection Service, USDA.

Action: Proposed Rule

Summary: The Food Safety and Inspection Service (FSIS) is proposing to amend the Federal meat and poultry products inspection regulations to eliminate specific labeling requirements for the prominent disclosure of certain information that qualifies product names. The proposed rule would eliminate those prominent disclosure requirements for product name qualifiers where the inclusion of a substance does not significantly alter the basic identity of the finished product or where the prominently disclosed information can be found in the ingredients statement. While prominent disclosure of certain product name qualifiers on product labels would no longer be a requirement, manufacturers would have the option of continuing to use such labeling if they so choose. This rule is being proposed as part of the Agency's label reform initiatives.

Dates: Comments must be received on or before January 4, 1993.

Addresses: Written comments to: Policy Office, Attn: Linda Carey, FSIS Hearing Clerk, room 3171, South Building, Food Safety and Inspection Service, U. S. Department of Agriculture, Washington, DC 20250. Oral comments as provided by the Poultry Products Inspection Act should be directed to: Mr. Ashland L. Clemons, (202)205-0042.

For Further Information Contact: Ashland L. Clemons, Director, Food Labeling Division, Regulatory Programs, Food Safety and Inspection Service, U. S. Department of Agriculture, Washington, DC 20250, (202)205-0042.

Supplementary Information:

Executive Order 12291

The Agency has determined that this proposed rule is not a major rule under Executive Order 12291. It would not result in an annual effect on the economy of $100 million or more; a major increase in costs or prices for consumers, individual industries, Federal, State or local government agencies or geographic regions; or significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

Executive Order 12778

This proposed rule has been reviewed under Executive Order 12778, Civil Justice Reform. States and local jurisdictions are preempted under the Federal Meat Inspection Act (FMIA) and the Poultry Products Inspection Act (PPIA) from imposing any marking, labeling, packaging, or ingredient requirements on federally inspected meat and poultry products that are in addition to, or different than, those imposed under the FMIA and PPIA. States and local jurisdictions may, however, exercise concurrent jurisdiction over meat and poultry products that are outside official establishments for the purpose of preventing the distribution of meat and poultry products that are misbranded or adulterated under the FMIA or PPIA, or in the case of imported articles, which are not as such an establishment, after their entry into the United States. Under the FMIA and PPIA, States that maintain meat and poultry inspection programs must impose requirements on State inspected products and establishments that are at least equal to those required under the FMIA and PPIA. The States, may, however, impose more stringent requirements on such State inspected products and establishments.

This proposed rule is not intended to have retroactive effect. Prior to any judicial challenge to the application of its provisions, applicable administrative procedures must be exhausted. Those administrative procedures are set forth in the rules of practice governing proceedings for labeling determinations at 9 CFR parts 335 and 381, Subpart W.

Effects on Small Entities

The Administrator, FSIS, has made an initial determination that this proposed rule would not have a significant economic impact on a substantial number of small entities. The proposed rule would ease regulatory requirements for certain segments of the meat and poultry industry and, thus, would provide a positive impact on the affected industry. Such manufacturers would no longer be required to prominently disclose certain product name qualifiers on their labels, although they may continue to use such labeling if they so choose. Thus, the current stock of these labels, which contains prominently disclosed product name qualifiers, is not affected by this rule. Manufacturers frequently revise such labels and, therefore, may simply delete the prominently disclosed product name qualifiers when they submit their revised labels for approval. Thus, any costs associated with new label applications would be covered under existing approved paperwork burdens of FSIS's prior label approval system.

Comments

Interested persons are invited to submit written comments concerning this proposed rule. Written comments should be sent to the Policy Office at the address shown above and should refer to Docket Number 92-005P. Any person desiring an opportunity for oral presentation of views as provided under the Poultry Products Inspection Act must make such request to Mr. Ashland Clemons so that arrangements may be made for such views to be presented. A record will be made of all views orally presented. All comments submitted in response to this proposal will be available for public inspection in the Policy Office from 9:00 a.m. to 12:30 p.m. and from 1:30 p.m. to 4:00 p.m., Monday through Friday.

Background

Parts 316, 317, 319, and 381 of the Federal meat and poultry products inspection regulations (9 CFR Parts 316, 317, 319, and 381) require certain types of information about the

product to be prominently disclosed with the product name. Over the years, technological advances, competition in the marketplace, and consumer interest in diet and health issues have resulted in a wide variety of new food products entering the marketplace. Historically, FSIS has taken the position that it would not unduly restrict the development and marketing of new products of manufacturing processes provided consumers have adequate information to make information choices about these new products. New products often contain ingredients used to improve a traditional product's sensory, shelf life, or nutritional characteristics, or to replace scarce or unavailable ingredients. While the ingredients used in these situations had to be safe and effective, they often differed from those ingredients used in a product's traditional counterpart. As a result, FSIS believed it was necessary to alert the consumer to the presence of unusual or unexpected ingredients by means of a prominent statement which accompanies the product name.

Correspondingly, innovations in food processing equipment and manufacturing practices have enabled food processors to develop and economically produce a wide variety of previously inconceivable or impractical food products. As regulations were developed to provide for these novel processing procedures, FSIS often included requirements for the prominent disclosure of such processes to accompany the product's name in an effort to help consumers identify such products.

In the past, requirements for the prominent disclosure of product name qualifiers were manageable since food products in the marketplace were fewer and less complex. However, as the variety and complexity of food products increased, and once novel products became commonplace, these labeling requirements became unwieldy and cumbersome. Moreover, the information conveyed with the product name was often repeated in the product's ingredients statement.

As a result of changes in the marketplace, FSIS has increasingly moved away from requirements for the prominent disclosure of product name qualifiers. Inevitably, inconsistencies in labeling policies have developed, further compounding the questionable need for such statements. For example, FSIS was petitioned in 1988 to eliminate prominent disclosure of certain binders and extenders that are foods or are derived from food ingredients in frankfurters and similar products. The petitioner contended, in part, that the Agency's application of its prominent labeling policy was inconsistent and often discriminatory.

After considering the petition, FSIS agreed that labeling policies did unfairly discriminate against manufacturers using binders and that the labeling policy requiring qualifiers for extenders used in frankfurters and similar products was also discriminatory. FSIS determined that the policies placed those using binders and extenders at a competitive disadvantage compared to those using similar ingredients which are not required to be prominently disclosed with the product name, and that such policies should be removed from the regulations. Additionally, FSIS believed that the required listing of ingredients in the product's ingredients statement provided consumers with informative labeling for making purchasing decisions.

This rulemaking, which was published on September 20, 1991 (56 FR 41445), did not cover the elimination of prominent disclosure of all binders nor binders in all products. Rather, the rule was limited to the prominent disclosure of binders on labels of frankfurters and similar products as requested by the petitioner. However, in the proposed rule on this subject, the Agency identified prominent labeling and product name qualifiers as issues to be further addressed during future proceedings planned for food standards and related labeling issues (56 FR 12126, March 22, 1991).

New Policy Direction

FSIS acknowledged the need to establish sound, consistent policy in determining the need for prominent labeling. To meet this end, FSIS reassessed its overall policy regarding prominent labeling and the various supporting rationales used throughout the years to establish prominent labeling requirements.

With various exceptions, FSIS believes that product qualifiers indicating the presence of substances should not be required (1) if the use of such substances does not significantly alter the basic identity of the finished product, and (2) if such substance is included in the ingredient statement. This rationale is based on the 1984 decision rendered by the United States Court of Appeals, District of Columbia Circuit, in the case of *Community Nutrition Institute, et al.* v. *John R. Block, Secretary of Agriculture, et. al.* regarding prominent labeling of mechanically separated (species) (MS(S)) product. The Community Nutrition Institute brought suit against Secretary Block on the grounds that products containing MS(S) were misbranded because the Secretary eliminated the requirement that such product labels bear a qualifying phrase indicating the presence of MS(S) in such products. The Court upheld the Secretary's justification for deleting the qualifying phrase on the grounds that his criterion for requiring such labeling is not whether the product contains a new or unexpected ingredient but whether that ingredient "significantly alters the basic identity of the finished product."

Conversely, FSIS believes that requirements for certain other product qualifiers should be retained in order to avoid any confusion by providing consumers with clear and complete information. Such prominent labeling includes the following:

1. Product name qualifiers depicting geographical origin, such as "Product of Denmark";
2. Product name qualifiers serving as ingredients statements, such as "Packed in Brine";
3. Statements prescribing safe handling and preparation of a product, such as "No Nitrites or Nitrates Added, Not Preserved—Keep Refrigerated";
4. Statements identifying the use of a species of animal that is not likely to be expected, such as "Lard—Beef Fat Added"; and
5. Phrases that are part of the product name, such as "Cured Turkey Thigh Meat" used in conjunction with "Turkey Ham."

Although the scope of this proposed rule would not affect these requirements, FSIS nonetheless welcomes comments on whether these product qualifiers should also be eliminated and any justification supporting such elimination.

For the complete article on Prominently Disclosed Product Name Qualifiers, see Federal Register/Vol. 57, No. 214/Pages 52596-52599/ Wednesday, November 4, 1992/Proposed Rules.

Food Processes and Controls

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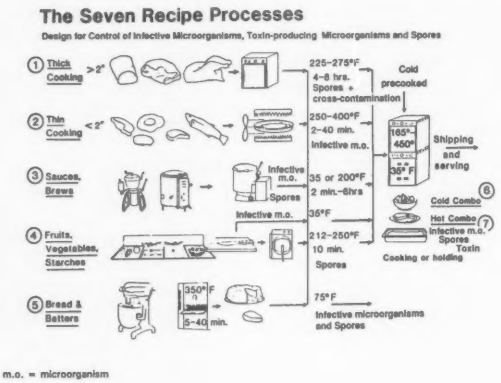
Once controls have been established for management, the consumer, environment, facility, equipment, personnel, and suppliers, only food processes remain to be controlled. For cook-and-serve recipes, there are seven recipe processes in terms of microbiological control. (FIG. 1)

Figure 1



m.o. = microorganism

Thick Foods

The first process is for **thick foods**, greater than 2 inches thick. When food thicker than 2 inches is heated, the process involves slow cooking (4 to 8 hours). This allows for adequate time and temperature for pathogen inactivation, according to traditional time-temperature standards. Roast beef, turkey, pork, etc., pasteurized to 3D (or 7D for immune-compromised people) *Salmonella* spp. destruction is a safe product. The hazard is the possible outgrowth of spores after the product is cooked. These multi-portion items frequently take many minutes to hours to serve. If the serving time is longer than 2 hours at a temperature of less than 130°F, there is a significant risk of illness due to *Clostridium perfringens*, a common contaminant of meat and poultry, because of its rapid generation time, 7.2 minutes at 106°F.

Thin Foods

For **thin foods**, cooking times are typically brief (2 to 40 minutes), and cooked food temperatures are often non-uniform because of the cooking device (e.g., as when cooking on a grill, griddle, or fryer). The problem with these foods is to ensure adequate time and temperature for pasteurization. A thermocouple probe with a grounded junction tip less than 1/16 inch in diameter must be used by the cook to measure food temperature in order to ensure that these food items have been adequately pasteurized. Once thin foods are cooked, they are considered to be single portion and should be eaten within a few minutes. Spore- and toxin-producing organisms are not a problem, if the foods are consumed within 2 hours.

Sauces and Brews

There are two styles of **sauces and brews**: **hot** and **cold**. Hot sauces are more than adequately pasteurized, even if boiled for only a brief time. The problem is spore outgrowth, if these sauces are not kept above 130°F or cooled to 40°F within 11 hours. The main problem with cold sauces such as salad dressing and mayonnaise is *Salmonella* spp., which probably contaminates the raw ingredients, along with proteolytic *Clostridium botulinum*. These organisms are controlled by making sure that the product's final pH level is less than 4.1. When dressings with a pH below 4.1 are stored at room temperature for 2 days, the pathogenic vegetative cells of *Salmonella* spp. are destroyed.

Fruits, Vegetables, and Starches

If food items in the **fruits, vegetables, and starches** category are served raw or cold, they must be given a double wash in clean, flowing water. This will reduce the pathogens by about 100:1. After washing, these foods should be dried to a normally dry condition for these foods in order to control surface mold and bacterial growth, kept below 35°F, and kept for only a minimum period of time. The objective is to serve them within 24 hours. If the food items such as potatoes and rice are cooked, the spores are activated and can grow out, which could cause illness. Hence, cooked, hot vegetables that have a temperature of less than 130°F should either be served within 2 hours in order to ensure their safety, or within 30 minutes to benefit from thermally sensitive vitamins, or cooled to 40°F within 11 hours.

Breads and Batters

Food items in the **breads and batters** category are not typically a problem, unless they are handled with contaminated hands. Problems occur with icings and fillings, which could have been prepared with contaminated ingredients and hands. Correct hand washing and the use of pasteurized ingredients ensure the safety of these products from ineffective organisms. However, with many bakery products, there will be a threat from *Bacillus cereus*. *Bacillus cereus* survives baking, and has a minimum pH control of 4.3 and

a_w of 0.912. Since these controls are difficult to meet with many bakery fillings other than fruit fillings, pastry items should be kept refrigerated unless specifically determined to be safe.

Hot and Cold Combinations

Finally, there are **hot and cold combinations**. These are made with products produced with methods 1 through 5. Hot combinations are made safe by heating meat, sauce, vegetables, and starches to at least 165°F. They are safe, provided they were not abused significantly prior to assembly and reheating, which would allow toxin production to occur. When cold combinations such as ham and macaroni salad are made, if the ingredients are cooled to 40°F in less than 11 hours and then mixed with clean hands at a temperature of less than 50°F, these products will be safe. They should be stored in a 35°F refrigerator. Food reheating, if done in less than 6 hours, will control the critical pathogen *Clostridium perfringens*. This can be done, depending on thickness, up to a temperature of 450°F, as shown in the figure.

One should not rely on reheating as a critical control procedure, however, because it will not control toxins that can be produced in pasteurized food. Once food is cooked, which allows for the possibility of toxin production due largely to the elimination of competitive microorganisms, food must be handled according to defined hazard control procedures in order to be safe: cooled to 40°F in less than 11 hours, kept below 40°F for less than 5 days, or kept below 32°F until spoiled.

USDA SPECIFIED CHILLED FOOD PROCESSES

In order to produce an extended refrigerated shelf life product, one must apply an outer cover to prevent post-processing contamination. This can be metal, plastic, paperboard, or glass.. In all cases, these packages will have a seal failure rate. A critical control is verification of the seal after package closure.

The USDA has identified a number of processes for extended shelf life chilled meat and poultry food items that are common in the food industry. From a hazard control standpoint of extended shelf life chilled foods, there are two overall categories: **cook-in-package**, and **cook-then-package**. (FIG. 2)

Cook-In-Package

Product cooked in the package and pasteurized will be safe if stored below 38°F (the beginning growth temperature for non-proteolytic *Clositridium botulinum*), provided the package is solid and has no leaks after processing. A very effective infective pathogen pasteurization control temperature is 160°F for at least 8 seconds.

Typical processes and products included in the cook-in package category are the **assemble—cook—package—chill** group (e.g., kettle-cooked stews, sauces, and soups), and **assemble—sear—package—cook—chill** group (e.g., sous vide; deli rolls and roasts; canned crab and ham; casseroles with meat, pasta, vegetable, and sauce combinations which are cooked in the package).

Figure 2

USDA SPECIFIED CHILLED FOOD PROCESSES*

COOK-IN-PACKAGE

1. Assemble–Cook–Package above 160°F–Chill
   - Stews, Sauces, Soups — PRE-PREP–>PASTEURIZE AND PACKAGE HOT–>CHILL
2. Assemble–Sear–Package–Cook–Chill
   - Sous vide
Rolls and roasts
Canned crab and ham — PRE-PREP–>VACUUM PACKAGE–>PASTEURIZE–>CHILL
   - Casseroles (Meat, pasta, vegetable, sauce combination) — PRE-PREP–>PAN–>COVER–>PASTEURIZE –>CHILL

COOK-THEN-PACKAGE

3. Cook–Chill–Assemble–Package
   - Roast or fried chicken
Other roasts
Uncured sausages — PRE-PREP–>PASTEURIZE–>CHILL–>PACKAGE
   - Uncured luncheon meat
Diced meat — PRE-PREP–>PASTEURIZE–>CHILL–>SLICE/DICE–> PACKAGE
   - Meat and pasta
Dinners
Meat and sauces
Sandwiches and pizza — PRE-PREP–>PASTEURIZE–>CHILL–>ASSEMBLE–>PACKAGE
   - Meat pies
Quiches
Patties
Pates — PRE-PREP–>PASTEURIZE–>FILL IN DOUGH–> CHILL–>PACKAGE
4. Assemble With Cooked and Raw Ingredients–Package [Chill, pasteurize (heat) or serve cold]
   - Chef's salad
Chicken salad
Sandwiches
Pizza with raw ingredients — PRE-PREP–>CHILL–>ASSEMBLE–>OPT.COOK/CHILL–>PACKAGE
   - Uncured jellied meats — PRE-PREP–>PASTEURIZE–>ADD RAW INGREDIENTS–>CHILL TO GEL–>PACKAGE

* Note: Food that is frozen after processing can have 20,000 - 50,000 microorganisms / gram after processing.

There will be pathogenic and spoilage spores that survive, as well as low levels of vegetative spoilage organisms, normally less than 50 per gram. Some spoilage-type *Bacillus* spp. spores can outgrow below 38°F over a period of time and spoil the food. If poor quality, high microbial count ingredients are used, then poor quality products with short shelf lives will result.

There will also be biological chemicals, left over from the inactivated microorganisms, that lead to flavor change. If food is stored at 40°F, it should be used in 5 days, a very safe standard. If it is stored at less than 30°F, which ensures that no pathogen will multiply even if there is a package leak, it can be held until spoiled.

What is spoilage? This is a subjective term. It depends on who is eating the product and how the consumer has been raised. For example, some people like kimchee; people who are not used to it believe that it is spoiled cabbage. Since it is "spoiled" or fermented by lactic acid microorganisms, it is as safe a product as buttermilk, cheese, and salami. The lower the pH is, and the more spices the product contains, the longer it will be acceptable. Note that from the moment the food is cooking, it is beginning to lose quality. Food should not be stored for any longer than absolutely necessary.

Cook-Then-Package

The cook-then-package group covers a wider variety of foods, and includes potentially hazardous processes because the food is manipulated after it is pasteurized. This manipulation must be done in an environment where pathogens can be kept out of the food. If food items from this category are stored above 38°F, they should be consumed in less than 5

days. If stored below 32°F, they can be held until spoiled.

There are two processes included in the cook-then-package category. The first process is **cook—chill—assemble—package**. In many instances, roasts, fried chicken, uncured sausage, etc., are cooked in large ovens. If they were packaged, the original packaging is removed, the food products are sliced, re-packaged, and sold. For example, luncheon meats are cooked, chilled, sliced in a clean room, packaged, and given a shelf life of 6 to 8 weeks. Meat and pasta dinners and meat pies are included in this group.

The final process, which produces the most potentially hazardous products, is **assemble with cooked and raw ingredients—package** group. This includes chef's salads, chicken salad sandwiches, pizzas, uncured jellied meats, etc. Many of these products are sold in grocery stores where temperature control is poor, which increases the hazard. If handled carefully, they will have a shelf life of 5 days at 40°F.

A Foodborne Illness Outbreak

From a safety viewpoint, as dangerous as the cook-then package processes are, the process itself has only been implicated once as the cause of a foodborne illness, whereby deli roast beef cooked in Pennsylvania for distribution in New York resulted in a number of people becoming ill from *Salmonella* spp. This incident led to the development of the USDA roast beef *Salmonella* spp. inactivation standards because some people thought that *Salmonella* spp. survived the cooking of the roast beef. However, others believed that it was more likely that workers, who were handling raw beef and had their hands contaminated with *Salmonella* spp., touched the cooked beef. The contamination of the roast beef combined with the extended time it took to get the beef distributed led to the outbreak.

Lactic Acid Bacteria — A Safety Factor

Products prepared in this manner often have APCs (aerobic plate count) of greater than 1,000,000 microorganisms per gram when consumed. These microorganisms are mostly spoilage organisms, such as **lactic acid producers**, which provide a competitive fail-safe element to the product, thus reducing the hazard.

HACCP FLOW DIAGRAMS — CHILLED FOOD PROCESSES

Assemble-Cook-Package Hot-Chill

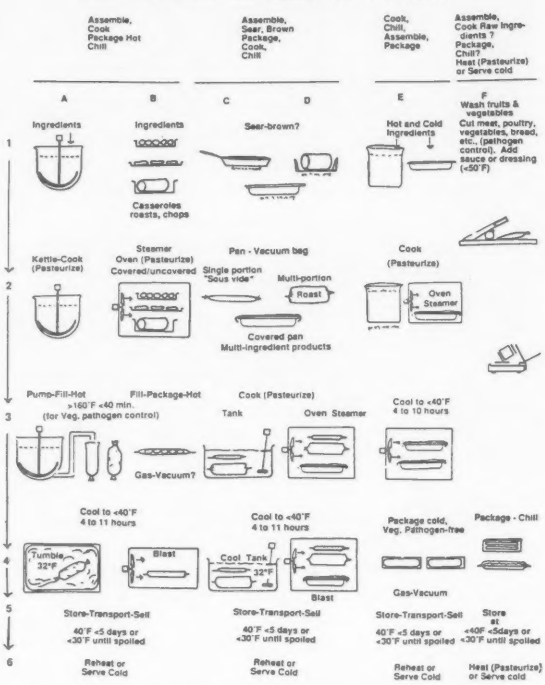
The diagram, **HACCP Flow Diagrams—Chilled Food Processes**, (FIG. 3) shows the four categories of chilled foods on the previous page in picture form. Columns A and B show products cooked in kettles or in ovens, and are packaged while hot, above 160°F. This provides adequate pasteurization. Then, they are cooled. If these products are stored at 40°F, they should be used in 5 days. If stored at less than 30°F, they can be held until spoiled.

Assemble-Sear-Brown-Package-Cook-Chill

The second group, columns C and D, includes items such as sous vide and rolled roasts, whereby they are packaged, cooked, cooled in 4 hours (FDA standard) to 11

Figure 3

HACCP FLOW DIAGRAMS-CHILLED FOOD PROCESSES



hours (USDA standard). Again, if these products are stored at 40°F, they should be used in 5 days. If stored below 30°F, they can be held until spoiled.

Cook-Chill-Assemble-Package

The third group, column E, cook—chill-assemble—package, consists of food items that can be packaged with gas or vacuum. However, this does little, to ensure safety because *Listeria monocytogenes*, *Yersinia enterocolitica*, and non-proteolytic *Clostridium botulinum* grow in gas atmospheres and vacuum. Vacuum or gas are really quality control variables because they normally encourage lactic acid bacteria to multiply. Unless, a food item is handled after cooking to exclude pathogens from the package, it must be assumed that there are some pathogens present. Therefore, the food must be used within 5 days if stored at 40°F, or it can be held until spoiled if stored at 30°F or below.

Assemble-Cook Raw Ingredients(?)-Package-Chilll(?)-Heat (Pasteurize) or Serve Cold

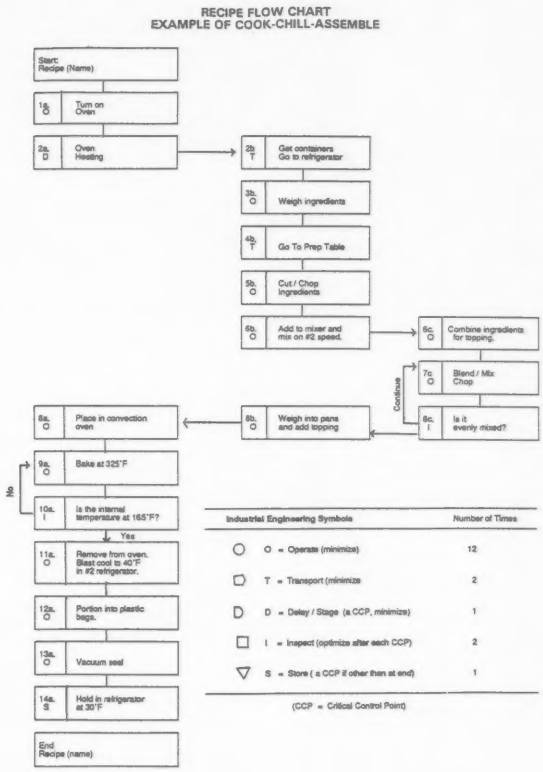
Food products in the final group must be assumed to contain *Listeria monocytogenes* and other contaminants. They should not be fed to immune-compromised people without pasteurization. The same holding times and temperatures (i.e., 40°F for up to 5 days; below 30°F until spoiled) should be applied.

Recipe Flow Chart Example of Cook-Chill-Assemble

When one is learning to apply HACCP to safe recipe design, one should begin by flow charting recipes. Flow charting recipes uses the same logic as computer flow charting. It is a means to develop a procedure for employees

to carry out with zero defects. It is essential that no process hazard is overlooked. Each of the seven styles of recipes should be charted. Recipes can be charted with three column flows, as shown in FIG. 4. Each step is numbered so that one can refer to it later.

Figure 4


RECIPE FLOW CHART
EXAMPLE OF COOK-CHILL-ASSEMBLE
Start: Recipe (Name)
1a. O Turn on Oven
2a. D Oven Heating
2b. T Get containers Go to refrigerator
3b. O Weigh ingredients
4b. T Go To Prep Table
5b. O Cut / Chop Ingredients
6b. O Add to mixer and mix on #2 speed.
6c. O Combine ingredients for topping.
7c. O Blend / Mix Chop
Continue
8c. I Is it evenly mixed?
8b. O Weigh into pans and add topping
8a. O Place in convection oven
9a. O Bake at 325°F
No
10a. I Is the internal temperature at 165°F?
Yes
11a. O Remove from oven. Blast cool to 40°F in #2 refrigerator.
12a. O Portion into plastic bags.
13a. O Vacuum seal
14a. S Hold in refrigerator at 30°F
End Recipe (name)
Industrial Engineering Symbols
Number of Times
O = Operate (minimize) 12
T = Transport (minimize 2
D = Delay / Stage (a CCP, minimize) 1
I = Inspect (optimize after each CCP) 2
S = Store (a CCP if other than at end) 1
(CCP = Critical Control Point)

Identifying the Work Processes in Each Step

In each block there is an industrial engineering symbol indicating the style of operation or procedure taking place. There are five basic procedure styles: **operate (O)**, **inspect (I)**, **transport (T)**, **delay (D)**, and **store (S)**. Identifying each step according to one of the symbols leads to optimum recipe flow charting. In order to optimize the efficiency of a recipe procedure, there should be only one "store" at the end of the flow chart, as many "inspect" steps as needed in order to ensure control, no "delays", minimal "transport" steps, and the fewest "operate" steps possible to produce the desired product for customer satisfaction. Also, one proposed recipe procedure can be compared with another. The best recipe is the one that has the least steps and ensures that a standard product is produced every time it is made.

Food Processes and Controls will be continued in Dairy, Food and Environmental Sanitation, January 1993.

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Free BUYERS GUIDE
for Food & Dairy Processors
contains 416 pages of hard-to-find & specialty items.

Food and dairy plants throughout the U.S. and Canada rely on the *Nelson-Jameson Buyers Guide* for products they simply can't find elsewhere. Products like the Sam Gray Gold Electrode™, Disinfectant Mat™, M926 Chloride Analyzer and RCS Air Sampler. Plus a host of other items they use every day. Our latest edition features a 128-page Laboratory & QA/QC section and a total of over 7,500 products. Call or write to request a copy.

Phone toll free 800/826-8302.
Fax toll free 800/472-0840 or
mail Reader Service Card.

NELSON JAMESON
Nelson-Jameson, Inc.
2400 East Fifth Street
Marshfield, WI 54449

FOODBORNE MICROBIAL PATHOGENS SYMPOSIUM

Held during the

80th IAMFES Annual Meeting

August 1-4, 1993
Stouffer Waverly Hotel, Atlanta, Georgia

Sponsored by

International Life Sciences Institute (ILSI)
ILSI North America Committee on Food Microbiology
ILSI Europe Working Group on Microbiology

will Feature Sessions on:

***Listeria monocytogenes*: Current Issues and Concerns**

International Perspectives on *Escherichia coli* 0157:H7

***Campylobacter* Update**

Microbial Concerns of the International Community

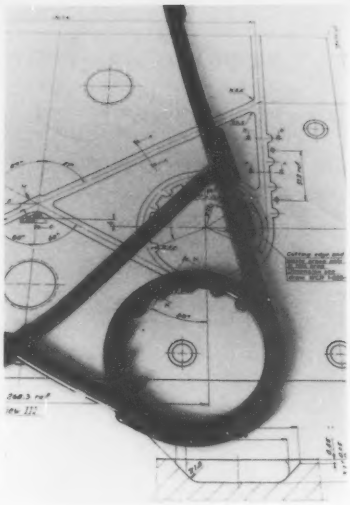
ILSI-Sponsored Research Update

For More Information, Contact:

International Association of Milk, Food and Environmental Sanitarians

800-369-6337 (U.S.) 800-284-6336 (Canada)
515-276-3344 515-276-8655 (Fax)

Industry Products



World Class Plate Heat Exchanger Gaskets at Down-to-Earth Prices

WCR plate heat exchanger gaskets are designed to provide world-class performance. WCR gaskets are unsurpassed by top-of-the-line gaskets offered by manufacturers of plate heat exchangers.

WCR offers extraordinary savings on these high quality gaskets. By switching from similar gaskets offered by manufacturers of plate heat exchangers, gasket replacement costs can be dramatically reduced. WCR offers a growing variety of gasket types. Gaskets are in stock, in quantity, and ready for immediate shipment.

WCR also offers comprehensive regasketing services. Their ten-step process assures complete reconditioning and careful regasketing of heat exchanger plates. All of this is typically accomplished in ten working days. With WCR gaskets and WCR regasketing services, processors get no hassles, single-source responsibility.

WCR - Dayton, OH

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Sani-Tech Just Completes New 48-page Color Catalogue

Sani-Tech Inc. of Andover, New Jersey, manufacturers of the finest in high-purity, sanitary process systems, has just completed a 48-page full color catalogue focusing on its STHT Silicone Tubing Systems and Products.

This catalogue introduces a number of innovative technologies fabricated from the platinum cured silicone elastomer. This super material has often been called the only true "Pharmaceutical Elastomer".

The primary focus of this publication, is to introduce the reader to yet another proven line of quality products from Sani-Tech. As the leader in sanitary connective technology, our research and development team has created a number of products with full validation and testing.

The reader will be introduced to:

THE STHT VULCANIZER: a complete in-field system for fabricating required tubing systems with crevice free, sanitary ends.

THE STHT SANI-LINK: a barbless, crevice-free system of Tees, Y's Cross Tees, Elbows.

THE STHT SANI-SEAL: a system of preventing potential process product contamination.

STHT COLOR IDENTIFICATION: an innovative process of coding to prevent cross-contamination.

STHT SILICONE LINERS: transforms an in-line stainless steel process system . . . into a totally non-metallic process system.

Sani-Tech, Inc. - Andover, NJ

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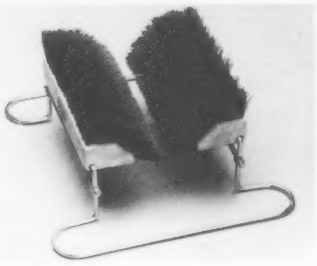

Sparta Boot N' Shoe Brush Ideal for Food Service and Supermarket Cleanliness

Food service managers will appreciate the cleaner food preparation areas that can result from using Sparta Brush Company's heavy duty Boot N' Shoe Brush.

Tracked in dirt and debris from the dumpster area can be greatly reduced by using Boot N' Shooe brushes at each access point to kitchens and other food preparation areas. The contoured V-shaped brushes feature 1-1/2" stiff plastic bristles to clean sides, front, back and soles of shoes and boots. The brushes flip up to oreveal a steel scraper bar to remove larger accumulations from the sole or instep.

New polypropylene plaastic foam blocks are held in place by steel swivel brackets bolted to an all-steel frame. The plastic bristles and blocks are"soak-proof", acid and weather resistant making them ideal for indoor or outdoor use. They can be cleaned with a water hose. The No. 2900 Boot N' Shoe Brush is shipped completely assembled.

Sparta Brush Co. - Sparta, WI

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Rugged, Easy-To-Apply Polyurethane Coating System Features Stainless Steel Pigment Resists Weather, Abrasion, and Corrosion

The STEEL IT Polyurethane Coating System features a unique stainless steel leafing pigment, and provides optimum weather-, abrasion-, and corrosion-resistance in general maintenance applications. The easy to apply system yields a hard, non-toxic, metallic finish that protects a multitude of metallic and non-metallic surfaces from ultraviolet rays, chemicals, oils alkalis, food acids, water immersion, abrasion, and high-pressure washdowns.

Comprised of STEEL IT Polyurethane #1002 applied over STEEL IT Weathering Primer #2203, the system adheres to surfaces aggressively, and is ideal for protecting structural steel and other metals. These single component coatings require no complicated mixing. Applied as they come from the can, they are dried and require no baking or heating.

USDA-approved for use in the food processing and handling industry where incidental food contact may occur, STEEL IT Polyurethane #1002 blends polyurethane resin with Type 316L stainless steel leafing pigment to produce a rugged, non-toxic, satiny metallic finish. STEEL IT Primer #2203 combines a modified alkyd resin, selected silicates, and iron ixides with Type 316L leafing pigment to produce a long-lasting primer for structural steel and other metals requring good rust-inhibiting qualities. The durable primer can withstand long periods of exposure in case of delay in applying the STEEL IT Polyurethane #1002 finish coat.

Stainless Steel Coatings, Inc. - So. Lancaster, MA

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CIPNET™ Automated Clean-in-Place Management

A new clean-in-place (CIP) management system, called CIPNET, has been developed by Micronetics International, Inc. The purpose of this system is to provide cost savings to the user by lowering water and chemical usage during CIP operations. The CIPNET system delivers these savings through strict monitoring and control of the CIP cycles allowing plant management to better control and optimize their cleaning protocols.

The CIPNET system incorporates the networking capabilities of BITBUS® with Microsoft® Windows™-based graphical data management software called the CIP Director. The CIPNET network gathers remote in-line sensor data such as temperature, conductivity, flow and pressure and displays and archives this data in real-time to a personal computer (PC) running the CIP Director software. The networking feature of CIPNET allows the PC to be located anywhere in the plant or in an office environment.

The software allows the operator to configure control programs and monitoring parameters of the CIP operations, generated alarm reports and view historical cleaning data. In addition, data can be gathered from many different locations and CIP loops (circuits) plantwide. This system also supports bar code card readers and operator entry to ensure user identity during the cleaning process. The CIPNET system is also accessible via modem thereby allowing plant management to query the system remotely.

Micronetics International, Inc. is an electronic systems integrator specializing in data acquisition and control. Micronetics provides distributed process control systems to a variety of industries worldwide.

Micronetics International, Inc. - New Berlin, WI

Please circle No. 245
on your Reader Service Card

Performance Air Handling for Critical, Clean Environments

Developed for the food industry, the ACUair Air Systems line of equipment has been designed to outperform traditional HVAC equipment with a cleanable design, advanced filtration systems and state-of-the-art control systems. The unit provides first-line protection against airborne contaminants and offers precise room pressurization and accurate levels of temperature and humidity.

The double wall construction is designed to eliminate breeding areas for contaminants. In addition, exterior and interior wall panels can be easily cleaned with a standard pressure washer. Cleanable, flat plate coils allow trapped particles to pass through, thus reducing buildup, expediting cleaning and making for high efficiency.

One of the most advanced features is the Direct Digital Control System. Standard on all units, this customized system allows for precision control of your environmental conditions.

The exclusive ACUair cartridge filtration system can last more than 5 times the average high efficiency filter, due to surface areas up to ten times greater than conventional bag filters. The filter achieves greater than 99% efficiency on 1 micron particles. This insures that yeast, molds and bacteria are captured.

ACUair Air Systems - Minneapolis, MN

Please circle No. 246
on your Reader Service Card

Ryan Instruments Offers a New Trip Service™ Program

Until now shippers and receivers of perishable products had to pay for all the services that were offered with a temperature recorder, even if those services were not used. That has now changed with the new and expanded Trip Service Program from Ryan Instruments.

Ryan Instruments, of Redmond, WA, has introduced a Trip Service program that offers three options of temperature recorders and service packages. So no matter how much, or how little you need, Ryan has a service package, product and price to fit your needs.

The MX™ is the newest addition to Ryan Instruments Trip Service program. With the introduction of the MX, Ryan offers three tiers of trip services matched by its three trip instruments.

The most sophisticated of Ryan's temperature recorders is the TripMentor™ with its micro-processor based technology. Link it to a Ryan TripWriter® and you have the ultimate intransit monitoring system. The analog strip-chart recorder, the UTI™, Universal Transit Instrument, has long been Ryan's standard. Customers purchase a full array of services when they use the TripMentor and UTI, including automatic accuracy verification, inventory management and maintenance of detailed records of each unit's lifetime and beyond. The newest recorder, the MX, is an analog strip-chart recorder, similar to the UTI.

Ryan Instruments - Redmond, WA

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on your Reader Service Card

Alconox Detergents Prolong the Life of Food, Beverage and Dairy-Product Processing Equipment without Leaving Interfering Residues

Alconox detergent brands such as CITRANOX®, LIQUI-NOX®, and ALCONOX® have long been used in critical-cleaning applications in food and beverage processing for manual and clean-in-place soil removal. These detergents have been used on food-contact equipment such as slicers, food extruders, mixers, grinders, wrappers, food tables, sight gauges and piping as well as for glassware cleaning in pilot and test laboratories.

Now, the company's TERG-A-ZYME® brand is finding applications in cleaning ultrafiltration (UF) and reverse-osmosis (RO) filter membranes. These membranes are used in a wide range of food process operations. In the dairy industry, whole and skimmed milk as well as cheese whey are concentrated through membrane separation. Once, raw cheese whey was simply disposed of, creating disposal problems and additional costs for producers. In the past five years, many processors have turned to concentrating their whey through reverse osmosis systems to yield a nutritive, marketable, high-protein concentrate.

Filter membranes are costly, so prolonging their useful life is essential in successful whey production. TERG-A-ZYME brand's unique protease enzyme and detergent formula have been found to be effective in cleaning RO and UF membranes to maintain required flow rates and desired rejection of dissolved solids, while rinsing away to leave no interfering detergent residues or contaminating food products.

Alconox - New York, NY

Please circle No. 248
on your Reader Service Card

Filtration for Cleaners

New bulletin describes filtration systems for aqueous and semi-aqueous cleaning solutions.

SERFILCO pump and filter systems improve cleaners that have a tendency to emulsify, as well as those that float oils, by continuously removing particulates, free oils and greases. This extends the life of the cleaners, provides more effective cleaning of parts and minimizes waste treatment costs.

Systems are offered in such chemical resistant materials as PVC, CPVC, PVDF and polypropylene to provide non-metallic solution contact.

Systems are suitable for spray or immersion cleaners and phosphating solutions with optional free oil removal, and are available in flow rates up to 9000 GPH.

SERFILCO, Ltd. - Northbrook, IL

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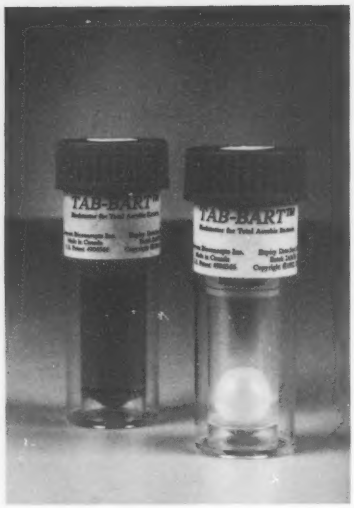

Detect Total Aerobic Bacteria Quickly with New TAB BARTs

A new Biological Activity Reaction Test (BART) easily detects Total Aerobic Bacteria (TAB). TAB BARTs, completely self-contained tests, require no costly instruments or additional apparatus. Use TAB BARTs in the laboratory or in the field. Just incubate at room temperature. The easy-to-read bleaching reaction simplified screening.

Growth of total aerobic bacteria can lead to problems in cooling towers and heat exchangers, power plant utilities, boiler systems, manufacturing process water, municipal water treatment plants, pools and spas, home water treatment systems, and hazardous waste systems. Establish a preventive program by testing samples with TAB BARTs once or twice each month.

Advantages of BARTS

- Results are distinct and easy-to-read.
- Traditional confirmation methods may be used to further identify bacteria.
- Shelf-life of two years.

For more information on TAB BARTs, request literature number 8355. For information on other BARTs for quick bacterial screening, request Hach's *1992-93 Products for Analysis* catalog, literature number 3213.

HACH Co. - Loveland, CO

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MASTiK™ Antibiotic Susceptibility Test

The rapid mastitis antibiotic susceptibility test kit, formerly sold as Mastassay™ (Pitman-Moore, Inc.), will now be exclusively sold by its inventor, Dr. George Saperstein, as MASTiK™ through LOTEK, Inc. Dr. Saperstein, a dairy veterinarian, invented this test out of frustration over the long time lag between diagnosis of mastitis and completion of often inaccurate human antibiotic susceptibility tests. MASTiK is a rapid (4-18 hours), accurate, and cost-effective test made exclusively for mastitis in animals.

MASTiK is the first antibiotic susceptibility test for use on the farm. Its use allows the dairyman to choose the most effective antibiotic earlier, thereby decreasing overall antibiotic use. It also allows dairymen to choose effective properly labelled antibiotics over extra-label drugs as well as the most effective antibiotic with the shortest milk and meat withdrawal time.

MASTiK is also sold to veterinarians and laboratories. The panel includes three (3) antibiotics that can be used only in a extra-label fashion. By using MASTiK, veterinarians can justify extra-label antibiotic use in cases in which all mastitis-labelled antibiotics are shown to be ineffective.

MASTiK is initially available by mail-order only.

LOTEK, Inc. - Pomfret, CT

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ISO-GRID Combined Coliform/E. coli Method Granted A.O.A.C. Official Final Action Status

QA Life Sciences, Inc. is pleased to announce that its 24 hour confirming enumeration test for both coliforms and *E. coli* using QA Life Sciences' ISO-GRID Membrane Filter has now been accorded the A. O. A. C.'s highest standing, Offical Final Action for all foods.

This ISO-GRID method uses two high performance culture media which were developed and are now being produced by QA Life Sciences, Inc. in California.

QA Life Sciences - San Diego, CA

Please circle No. 252
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Guide to Laboratory Water Purification Aids Equipment Selection

Labconco Corporation offers an Industry Service Publication entitled, "A Guide to Laboratory Water Purification." The twelve page booklet guides and informs laboratory personnel in the selection of water purification equipment for their specific needs.

First, water quality standards and the testing of contaminants are discussed. Purification methods are then compared for effectiveness and ease of use, with qualifying questions included throughout to help in determining the level of water purity needed for various laboratory procedures and the most practical purification methods for reaching these levels.

A brief discussion of how Labconco's water systems address problems associated with traditional approaches to water purification, is included near the back. Finally, a glossary of terms and a bibliography are enclosed.

Labconco Corp. - Kansas City, MO

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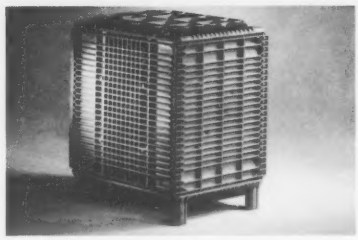

640 Cheese Shipper is First Plastic Container to Receive USDA Acceptance

The Dairy Division of the United States Department of Agriculture (USDA) has given acceptance to the Atlas 640 Shipper™, making it the first all-plastic cheese container to meet the USDA's Guidelines for the Sanitary Design and Fabrication of Dairy Equipment, A. R. Arena Products, Inc. announced today.

The Atlas 6640 Shipper, a rugged, collapsible container fabricated entirely of recyclable engineering plastics, offers cheese makers and processors a number of benefits, including the ability to fully sanitize the container using conventional washing systems installed at most plants. Since it does not require an outside refurbishing process between uses, the Atlas Shipper can be moved directly from the cheese plant to the cutting plant and back again, streamlining shipping operations and resulting in significant cost savings.

"The USDA Dairy Division's acceptance of the Atlas 640 Shipper is a significant milestone for the industry," said Tony Arena, president and founder of A. R. Arena Products, Inc. "In addition to offering productivity and shipping advantages over conventional 640 containers, the Atlas Shipper provides a cost-effective solution for dairy plants to comply with stringent food safety and environmental regulations."

The Atlas Shipper, which can be used with whey recovery systems accepted by the USDA Dairy Division, offers dairy plants an alternative to traditional wooden 640 cheese forms. Unlike wooden containers, the Atlas Shipper meets the sanitary requirements necessary for whey recovery. Design features that help reduce the risk of contamination include smooth-surfaced, all-plastic construction of walls, pallet, cover, and press board, and the elimination of steel corner brackets and horizontal banding. In addition, by facilitating whey recovery, the Atlas Shipper can help cheese plants better comply with phosphorus effluent standards and reduce waste disposal costs.

A. R. Arena Products, headquartered in Rochester, NY, specializes in the complete design, development, and production of material handling containers and pallets, utilizing the most advanced computer-aided-design techniques and thermoplastic technology.

A. R. Arena Products - Rochester, NY

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on your Reader Service Card

100% Stronger Butterfly Valves Described in New Product Bulletin

A new line of 150 PSI rated 10-inch and 12-inch plastic butterfly valves that are 100% stronger than conventional PVC valves are described in detail in a six-page, full color product bulletin from Hayward Industrial Products. The introductory section of the bulletin explains how these valves were designed, utilizing the exceptional properties of Fiberloc™ PVC, an advanced formulation from B. F. Goodrich. A bar graph is used to clearly illustrate the new material's advantage over ordinary PVC.

An individual page is devoted to describing each of the three available valve types; manually operated, electrically actuated and pneumatically actuated. The features and options are clearly shown for each of these. Detailed specification data make it easy to choose the correct valve for a particular application. Photos and line drawings are used to show valve dimensions and component parts. Both users and specifiers of large size butterfly valves will find this bulletin useful.

A technical information page features two charts. One provides operating pressures and temperatures and another shows pressure drops at various flow rates. Also, a detailed-cut-away drawing and parts list shows the valve's internal parts.

Hayward Industrial Products, Inc. - Elizabeth, NJ

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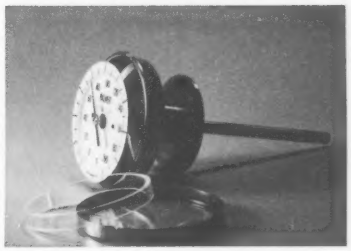

Palmer Instruments Announces New Sanitary Bimetal Thermometer

Palmer Instruments, Inc. announces our *New* — Sanitary Bimetal thermometer! This is the first bimetalic thermometer that meets 3-A Sanitary Standard 09-09.

This new Sanitary Bimetal thermometer is installed directly into the process - eliminating the need for a thermowell - and making ***response time faster*** than mercury in glass and other types of bimetal thermometers. The initial investment and future costs are also lower than other types of thermometers. The exclusive one piece solid 304 Stainless Steel 1-1/2" and 2" Tri-Clamp® connection, and extra strong 5/16" diameter stem with a 5/16" radius comply with 3-A Sanitary Standard 09-09. Standard stem lengths are 2-1/2" and 4-1/2" long.

Our unique ***replaceable element*** bimetal thermometer has a cartridge design which makes replacements less expensive and allows for easy range or scale changes. The replaceable element assembly comes precalibrated and ready for installation by a technician who can install it as easily as batteries into a flashlight. The Sanitary Bimet is environmentally friendly since you never dispose of a functional case.

The case is hermetically sealed with a bayonnet style bezel ring and a plexiglass cover. The dial sizes are 3" and 5" in Back Connected and All Angle types. The anti-parallax dial has black lines and numbers on a white background with a black adjustable pointed which also makes recalibrations simple.

The new Sanitary Bimet is accurate within one scale dicision, thus accuracy up to 1/2° F is available. The Sanitary Bimet has a ***One Year Warranty*** and ***Free Lifetime Recalibration Service*** included.

Palmer Instruments, Inc. - Asheville, NC

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Oxoid Listeria *Selective Supplement (MOX)*

A new supplement for the isolation of *Listeria monocytogenes* from specimens containing a mixed bacterial flora has been introduced by Unipath. Listeria Selective Medium (MOX) is a modification of the Oxford Listeria Selective Medium and is based on the formulation which forms part of the USDA-FSIS recommendation method for the isolation and identification of *Listeria monocytogenes* from processed meat and poultry products. Each package of MOX supplement is sufficient to supplement 5 litres of Oxford base medium.

Unipath Co., Oxoid Division -

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Attractive, Highly Durable Floors

Stonhard, Inc. brings you a cost-effective alternative to terrazzo floors — STONBLEND GSI®. This system combines decorative looks with superior performance. Stonblend GSI is a 3/16", three component, multi-quartz epoxy formulation with a variety of applications ranging from food and pharmaceutical facilities to educational and correctional facilities.

The Stonblend floor is chemical resistant, slip resistant and stain resistant, equalling a product that is highly durable, easy to maintain and pleasing to the eye.

STONHARD - Maple Shade, NJ

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Ultrafiltration Membrane Cartridges for Process Applications

CUNO Separations Systems Division is now offering a series of ultrafiltration (UF) membrane cartridges for high recovery process separations. CUNO cartridges are designed for separations ranging from depyrogenation of water to pretreatment of municipal water, to food, dairy and pharmaceutical/laboratory processes.

CUNO manufactures spiral-wound UF cartridges available in 10,000, 30,000, 100,000 and 500,000 molecular weight cutoffs. They exhibit flow rates ranging from 5 to 52 gpm at 50 psi transmembrane pressure and 25°C. Available in a variety of sizes and configurations, CUNO cartridges fit both new and existing hardware.

The spiral-wound configuration provides high membrane surface area with low holdup and minimum process volumes. CUNO process cartridges feature "uniform crossflow velocity" which minimizes fouling and maximizes recovery. Additionally, they can operate at high feed pressures, tolerate line pressure fluctuations and are easily cleaned and quickly replaced when necessary.

CUNO polyethersulfone membrane provide greater levels of purification and higher flow rates than conventional membranes. Each CUNO UF cartridge is assembled in a clean room and integrity tested. CUNO cartridge materials of construction meet USP XXI Class VI Plastics Test Criteria for Extractables, certifying the lowest level of extractables possible.

CUNO Separations Systems Division - Norwood, MA

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on your Reader Service Card

New Brochure Outlines Process Tank Technology

A new 10-page brochure from APV Crepaco describes APV's unique approach to process tank design and manufacturing. Their "Building Block" selection of top and bottom shapes, combined with heat exchange surfaces for water, steam, or direct expansion and the widest choice of agitation available, results in a tank customized for each specific application.

Basic specifications, options, and application information is included along with discussions on product specific design and the importance of total quality manufacturing.

APV Crepaco, Inc. - Lake Mills, WI

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Affiliate News

GAFES Officers:
Kneelinig (l to r): Bob Brackett, Dave Fry
Standing (l to r): Frank Pool, Dave Hamilton, Mark Harrison, Joe Frank, Mike Doyle, Larry Beuchat, Al Fain

Georgia Association of Food and Environmental Sanitarians Fall Education Symposium

On Friday, September 18, 1992 the Georgia Association of Food and Environmental Sanitarians and the Georgia Environmental Health Association sponsored an education symposium entitled "Seafood Safety and Quality." This was the first joint meeting of the two associations and the program drew registrants from both groups. The symposium was held at the Skidaway Institute of Oceanography, Skidaway Island, Georgia and was attended by over 80 people.

Larry Beuchat, GAFES Vice President, put together the program that included the following topics: "Microbiology of Seafoods: Safety and Spoilage" by Mark A. Harrison, University of Georgia, Athens, "Safety and Quality of Seafoods in Coastal Waters and on Vessel" by Keith W. Gates, University of Georgia Marine Extension Service, Brunswick, "Georgia's Shellfish Sanitation Program" by Brad C. Williams, Georgia Department of Administration Seafood Inspection Program" by Robert E. Kline, USFDA, Atlanta, "Quality of Seafoods in the Retail and Food Service Markets" by Vincent Russo, Vincent Russo's Catering, Savannah, and "Commercial Gamma Processing of Seafoods" by Gary Rodrick, University of Florida, Gainesville.

The lunch was a low country seafood boil catered by one of the speakers, Vincent Russo. This was a great way to tie in the theme of the program with a delicious meal.

Upcoming IAMFES Affiliate Meetings

1993

JANUARY

•**19, Alberta Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the University of Alberta Faculty Club (downstairs), Edmonton, Alberta. For more information, contact James Steele at (403)427-2643.

FEBRUARY

•**23-25, Kentucky Association of Milk, Food and Environmental Sanitarians, Inc.'s Annual Meeting** will be held at the Quality Hotel Riverview, 666 W. 5th Street, Covington, KY 41011. For more information please contact Anita Travis at (502)564-3127.

MARCH

•**18-19, Florida Association of Milk, Food and Environmental Sanitarians Annual Meeting** in conjunction with Suppliers Night at the Marriott on International Drive. For more information, please contact Bill Thornhill, 3023 Lake Alfred Road, Winter Haven, FL 33881, (813)299-6555.

APRIL

•**7-9, Missouri Milk, Food and Environmental Health Association's Annual Education Conference** will be held at the Ramada Inn, Columbia, MO. For more information contact Janet Murray at (816)263-6643.

AUGUST

•**1-4, 80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.** to be held at the Stouffer Waverly Hotel, Atlanta, GA. For more information please contact Julie Heim at (800)369-6337 (US) or (800)284-6336 (Canada).

Life After the Annual Meeting in Toronto

Our first concern was, of course to "pack up and git gone" from our office in Ames and get settled in Des Moines. We still have some adjustments to make but for the most part we are enjoying the additional space and enhanced working conditions.

Steve and I spent the latter part of September traveling to visit with you Affiliates. It was a little hectic but I think he was in Wyoming, Pennsylvania with additional responsibilities in Texas, Georgia, and Washington.

My first Affiliate meeting was with Minnesota. The sessions ended at noon on Friday and I then flew, on Saturday to Nashville, Indiana for two days of their conference and traveled on to Eau Claire for the Wisconsin Affiliate meeting. This was my first visit to both Minnesota and Wisconsin but I was not surprised that their meetings were planned with the same excellence as Indiana.

The first of October was spent with the Ohio Affiliate. This meeting was unusual and very interesting. It was held at the Honda Plant, watch for the write-up from Gloria (Past-President and Delegate).

The following week on Oct 14-15 Iowa held their 51st Annual Meeting in Waterloo.

Illinois Annual Meeting was held Oct 20 at the Carlisle, in Lombard. A very full one day session.

Mississippi again held their Meeting in conjunction with the Mississippi Public Health. This Affiliate is growing and will very soon be standing on their own for their Conference.

The first week of November found me in Dickinson, North Dakota. Everyone misses Allen Saylor since FDA took him East. A new Delegate has been named, Gary Hoffman, and will represent ND in Atlanta.

Today November 12, Alabama is meeting and I believe that IAMFES is being represented by Ruth Fuqua, Affiliate Council Chairperson. Steve is in Ontario, Canada not only to be an IAMFES presence but to commend the entire membership for their support in making the 79th Annual IAMFES Meeting such a great success.

I haven't said much about the actual programs of each Affiliate, I discussed with Randy Hanson at the Iowa meeting the importance of all affiliate members being able to share ideas through out the country. We thought to print the programs but that would take to much space so what I am going to do is copy these programs and mail to each Delegate and persons of states working on an Affiliate to give them ideas.

We will be printing complete write-ups from each Affiliate as they come in.

One last note: You have all been so helpful and supportive to me as I sail in and out of your states, it makes traveling a joy, thank you.

Dee Buske
Affiliate Liaison

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3-A Sanitary Standards for Uninsulated Tanks for Milk and Milk Products, Number 32-01

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius of new developments. Specifications for uninsulated tanks heretofore and hereafter developed which so differ in design, material, fabrication, or otherwise as not to conform with the following standards, but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS, and DIC at any time.

A

SCOPE

A.1

These standards cover the sanitary aspects of uninsulated tanks, both open top and closed types and both single and multiple compartment types, that are intended to be used for one of the following purposes:

A.1.1

Mixing of milk and milk products and ingredients.

A.1.2

Storage of milk and milk products in uninsulated tanks intended to be located in a room in which the air surrounding the tank will maintain the product temperature.

A.1.3

Storage of milk and milk products in uninsulated tanks having heat exchange surfaces to maintain the product temperature.

A.1.4

As a raw product constant level tank in a pasteurizing system.

A.1.5

As a product surge or feed tank within a milk or milk products processing system.

A.2

In order to conform with these 3-A Sanitary Standards, uninsulated tanks shall comply with the following design, material, and fabrication criteria.

B

DEFINITIONS

B.1

Product: Shall mean milk and milk products.

B.2

Uninsulated Tank: Shall mean a cylindrical, rectangular, oval or other equally satisfactorily shaped tank that is not insulated and is used as described in Sections A.1.1 through A.1.5 of these 3-A Sanitary Standards.

B.3

Open Top Type Tank: Shall mean an uninsulated tank that (1) can only be operated at atmospheric pressure and (2) the opening(s) for inspection and/or access for manual cleaning have removable or hinged cover(s) other than pressure type cover(s).

B.4

Closed Type Tank: Shall mean an uninsulated tank that (1) can be operated at atmospheric pressure or at a pressure above or below that of the atmosphere and (2) the opening(s) for inspection and/or access for manual cleaning is a manhole(s) with a pressure type cover(s).

B.5

Surfaces

B.5.1

Product Contact Surfaces: Shall mean all surfaces which are exposed to the product, or from which liquids may drain, drop or be drawn into the product.

B.5.2

NonProduct Contact Surfaces: Shall mean all other exposed surfaces.

B.6

Mechanical Cleaning or Mechanically Cleaned: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

B.7

Control Area(s): Shall mean the area(s) in which all appurtenances for the operation of the uninsulated tank and vent lines terminate and shall be a part of one or more of the following:

B.7.1

A processing area

B.7.2

An area in the plant at least the equivalent of a processing area.

C

MATERIALS

C.1

All product contact surfaces shall be of stainless steel of the AISI 300 Series*1 or corresponding ACI*2 types (See Appendix, Section E.) or metal which under conditions of intended use is at least as corrosion-resistant as stainless

*1 *The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, November 1990, Table 2-1, pp. 19-20. Available from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412-776-9460).*

*2 *Steel Founders Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016 (708-299-9160).*

steel of the foregoing types and is nontoxic and nonabsorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for umbrellas, slingers and drip shields for vertical agitator assemblies, agitator seals, gaskets, seals, caps and parts having the same functional purposes.

C.1.2

Rubber and rubber-like materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-00.

C.1.3

Plastic materials may be used in sight and/or light openings and for umbrellas, slingers and drip shields for vertical agitator assemblies, bearings, gaskets, seals, caps, outlet valves, direct reading gauge tubes and parts having the same functional purposes.

C.1.4

Plastic materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastics Used as Product Contact Surfaces for Dairy Equipment, Number 20-17 as amended.

C.1.5

Rubber and rubber-like materials and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C.1.6

The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic.*[3]

C.1.7

Where materials having certain inherent functional properties are required for specific applications, such as bearing surfaces and rotary seals, carbon, and/or ceramic materials may be used. Carbon and/or ceramic materials shall be inert, nonporous, nontoxic, nonabsorbent, insoluble, resistant to scratching, scoring and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.1.8

In a processing system to be sterilized by heat and operated at a temperature of 250 degrees F (121 degrees C) or higher, all materials having product contact surface(s) used in the construction of uninsulated tanks and nonmetallic component parts shall be such that they can be (1) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250 degrees F (121 degrees C) and (2) operated at the temperature required for processing.

C.2

Nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Nonproduct contact surfaces shall be relatively nonabsorbent, durable and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

D

FABRICATION

D.1

All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix, Section F.)

D.2

All permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices. (See Appendix, Section F.)

D.3

Uninsulated tanks that are to be mechanically cleaned shall be designed so that the product contact surfaces of the uninsulated tank, including the product contact surfaces of the opening for a vertical mechanical agitator, and all nonremovable appurtenances thereto can be mechanically cleaned and are accessible for inspection.

D.4

Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an assembled position or when removed. Removable parts shall be readily demountable.

D.5

Appurtenances having product contact surfaces shall be easily removable for cleaning, or shall be readily cleanable in place.

D.6

All product contact surfaces shall be self-draining except for normal clingage.

D.6.1

Horizontal cylindrical uninsulated tanks shall have a bottom pitch of at least 1/4 in. per ft (20 mm per m) toward the outlet.

D.6.2

Vertical cylindrical uninsulated tanks shall have a built-in bottom pitch of at least 3/4 in. per ft (60 mm per m) toward the outlet or if the bottom is of the reverse-dish type, that portion of the bottom adjacent to the sidewall shall have a minimum slope of 3/4 in. per ft (60 mm per m) toward the outlet.

D.6.3

Uninsulated tanks other than vertical cylindrical types shall have a built-in bottom pitch of at least 3/4 in. per ft (60 mm per m) toward the centerline and the centerline shall have a pitch of at least 1/4 in. per ft (20 mm per m) toward the outlet.

*[3] *Adhesives shall comply with 21 CFR Part 175 - Indirect food additives. Adhesives and components of coatings. Document for sale by the Superintendent of Documents, U.S. Government Office, Washington, DC 20402 (202-783-3238).*

D.6.4
All uninsulated tanks shall be constructed so they will not sag, buckle or prevent complete drainage.

D.7
The bottom of a raw product constant level tank to be used in a pasteurizing system shall have a built-in pitch of at least 1/4 in. per ft (20 mm per m) toward the outlet.

D.8
Uninsulated tanks having an inside height of more than 96 in. (2500 mm) shall be provided with means that will facilitate manual cleaning and inspection of all product contact surfaces (See Appendix, Section J.) or means shall be provided for mechanically cleaning the product contact surfaces of the uninsulated tank and all nonremovable appurtenances thereto. (See Appendix, Section G.)

D.8.1
The top head of a vertical uninsulated tank of more than 96 in. (2500 mm) in height, designed for mechanical cleaning, shall be dished or otherwise shaped so that it readily facilitates mechanical cleaning.

D.9
Gaskets

D.9.1
Gaskets having a product contact surface shall be removable or bonded.

D.9.2
Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in such a manner that the bond is continuous and mechanically sound so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

D.9.3
Grooves in gaskets shall be no deeper than their width unless the gasket is readily removable and reversible for cleaning.

D.9.4
Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6 mm) in depth or be less than 1/4 in. (6 mm) wide, except those for standard O-Rings smaller than 1/4 in. (6 mm), and those defined in Section D.12.

D.10
Radii

D.10.1
Internal angles of 135 degrees or less on product contact surfaces shall have radii of not less than 1/2 in. (13 mm), except that:

D.10.1.1
Smaller radii may be used when they are required for essential functional reasons, such as those of agitator shaft bottom supports or guides, if used, and in covers and agitator assemblies. In no case shall such radii be less than 1/8 in. (3 mm).

D.10.1.2
The radii in gasket grooves, or gasket retaining grooves or grooves in gaskets except those for standard 1/4 in. (6 mm) and smaller O-Rings, shall be not less than 1/16 in. (2 mm).

D.10.1.3
The radii in grooves for standard 1/4 in. (6 mm) O-Rings shall be not less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) O-Rings shall be not less than 1/32 in. (1 mm).

D.10.1.4
The minimum radii for fillets of welds in product contact surfaces shall be not less than 1/4 in. (6 mm) except that the minimum radii for such welds may be 1/8 in. (3 mm) when the thickness of one or both parts joined is less than 3/16 in. (5 mm).

D.11
There shall be no threads on product contact surfaces.

D.12
All sanitary fittings and valves shall conform to the applicable provisions of the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products as amended, Parts I and II, Numbers 08-17, 08-17A, 08-17B, 08-17C, 08-17E, 08-17F, and 08-17H.

D.12.1
Sanitary fittings made of optional metal alloy shall not be used.

D.13
All sanitary tubing shall conform to the applicable provision of the 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-00.

D.14
An exception is made to D.12 and D.13 in that materials conforming to C.1.2 or C.1.4 may be used for caps of sanitary design for the protection of terminal ends of sanitary tubes, fittings or vents.

D.15
Covers

D.15.1
Covers shall be furnished for all openings in the uninsulated tank except those fitted with permanently attached sanitary fittings.

D.15.2
Main covers for open top type uninsulated tanks shall; (1) be of a type which can be opened and maintained in an open position, (2) be sufficiently rigid to prevent buckling, (3) be self-draining in the closed position, (4) be provided with an adequate, conveniently located and durable handle(s) of sanitary design, which is welded in place or formed into the cover materials, (5) have downward flanges not less than 3/8 in. (10 mm) along all edges and (6) be close fitting. The design shall be such that when raising the cover(s) any liquid on the top will not enter the uninsulated tank. When the cover(s) is in its fully opened position, the drops of condensate formed on the underside of the cover(s) shall not drain into the uninsulated tank.

D.15.3
Bridges and fixed covers for open top type uninsulated tanks shall pitch to the outside edge(s) of the uninsulated tank for complete drainage, and shall have a raised flange not less than 3/8 in. (10 mm) in height where the edge(s)

meets the main cover(s). The bridges and fixed covers shall be integral with or continuously welded to the lining, and shall be installed so the underside is accessible for cleaning and inspection without completely entering the uninsulated tank.

D.15.4

Manhole covers for closed type uninsulated tanks in the side walls and/or ends shall be either the inside or outside swing type. If the cover swings inside, it shall also swing outside away from the opening. Threads or ball joints employed to attach the manhole cover(s) and its appendages shall not be located within the lining. Covers for manholes in the top of uninsulated tanks shall be of the outside swing type and shall have downward flanges not less than 3/8 in. (10 mm) along all edges and shall be close fitting.

D.15.5

Covers of raw product constant level tanks to be used in pasteurizing systems that are 18 in. (460 mm) or more in diameter, or more than 2 sq ft (0.18 sq m) in horizontal cross section area shall be provided with an inspection port or opening at least 4 in. (100 mm) in diameter. Opening(s) for appurtenance(s) or sanitary pipes(s) in cover(s) for a raw product constant level tank used in a pasteurizer system shall not be more than 1/4 in. (6 mm) larger in diameter than the entering appurtenance(s) or sanitary pipe(s).

D.16

Openings

D.16.1

Openings in fixed covers, or in bridges or main covers of open top type uninsulated tanks, except those for agitators, and openings with permanently attached sanitary pipeline fittings and thermometers that remain in place while product is in the uninsulated tank, shall be provided with removable covers which are designed to make close contact with the upper edges of the opening or cover surface. When the main cover is in an open position, the removable cover(s) shall remain in position.

D.16.2

The edges of openings in the top enclosure, main cover, or bridge shall extend upward at least 3/8 in. (10 mm) or be fitted with a permanently installed sanitary fitting. Openings that extend outward, generally horizontal, shall be fitted with a permanently installed sanitary fitting.

D.16.3

All openings in the closed type uninsulated tank shall be within a control area except as provided for in D.19.6. Openings for cleaning, overflow and/or vent line(s) shall terminate in a control area. The terminal ends of the cleaning, overflow and/or vent line(s) in the control area shall be arranged or means provided to prevent liquids or objects from being drawn into the vent and cleaning solution line(s). Vent or overflow line(s) terminating in a control area shall be provided with a perforated cover having openings not greater than 1/16 in. (2 mm) diameter or slots not more than l/32 in. (1 mm) wide. This cover(s) shall be designed so that parts are readily accessible and easily removable for cleaning. Woven wire mesh shall not be used for this purpose.

D.16.4

Agitator shaft openings through the bridge or top enclosure shall have a minimum diameter of 1 in. (25 mm) on uninsulated tanks which require removal of agitator shaft for cleaning, or be of a diameter that will provide a 1 in. (25 mm) minimum annular cleaning space between the agitator shaft and the inside surface of the flanged opening on uninsulated tanks which do not require removal of the agitator for cleaning.

D.16.4.1

Uninsulated tanks with top mounted agitators which require removal of the agitator shaft for cleaning shall have a maximum shaft length of 96 in. (2500 mm) and a maximum diameter of 2 in. (50 mm).

D.16.5

A manhole opening shall be provided in closed type uninsulated tanks. If there is more than one control area, there shall be a manhole accessible from the lowest control area. The inside dimensions of the manhole(s) opening shall not be less than 15 by 20 in. (380 by 510 mm) oval, or 18 in. (460 mm) in diameter. The sleeve or collar of a manhole opening for an inside swing type manhole cover shall be pitched so that liquids cannot accumulate. Uninsulated tanks with a capacity of 300 gal (1125 L) or less may have top opening manholes having a diameter of not less than 16 in. (410 mm).

D.16.5.1

A hand grip shall be mounted externally on the uninsulated tank near the manhole in order to afford easy access to the uninsulated tank's interior.

D.16.6

Sight and light openings, when provided, shall be in the top enclosure and shall be of such design and construction that the inner surfaces drain inwardly and the plastic shall be removable for cleaning. If the uninsulated tank is designed for mechanical cleaning, the inner surface of the plastic shall be relatively flush with the inner surface of the uninsulated tank. The inside diameter of the opening(s) into the uninsulated tank shall not be less than 3- 3/4 in. (95 mm).

D.16.7

Instrument connections shall conform to the applicable provisions of the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Milk and Milk Products Equipment, Parts I and II, Number 09-09.

D.16.7.1

Tanks designed to be used in applications found in A.1.2 and A.1.3 shall be provided with one or more fittings to accommodate indicating and/or recording thermometer temperature sensing devices.

D.16.7.2

When thermometers are installed through the side wall, the location shall be such that the thermometer(s) is easily readable. Thermometer connections and/or openings shall be located so that the thermometer is not influenced by the heating or cooling medium.

D.16.7.3

If the fittings for temperature sensing devices which do not pierce the tank lining, either the temperature sensing element receptacles shall be securely attached to the

exterior of the lining or means to attach temperature sensing elements securely to the exterior of the lining shall be provided.

D.16.7.4

A pressure or level sensor, if provided, shall comply with the applicable provisions of the 3-A Sanitary Standards for Pressure and Level Sensing Devices, Number 37-01. If the uninsulated or constant level tank in which it will be used is designed for mechanical cleaning, the product contact surface of the device shall be relatively flush with the inner surface of the tank.

D.16.8

Pasteurized product inlets to raw product constant level tanks, if provided, such as recirculate, divert and leak detection lines, shall terminate at the top or side of the raw product constant level tank. These lines shall terminate at a distance of at least two times the diameter of the largest return pipeline above the maximum flood level of the tank.

D.16.8.1

The pasteurized pipeline(s) returning to the raw product constant level tank shall enter the top of the tank and shall be fabricated to prevent the back flow of raw milk into the pasteurized milk pipeline. One method of complying with this is as follows:

(1) Determine the maximum flood level for the raw product constant level tank at an overflow condition. This level may be the top of the highest opening equivalent to, or greater than two times the diameter of the largest inlet (supply) pipeline.

(2) The constant level tank design must provide for all return pipelines to break to atmosphere at a distance equal to, or greater than two times the diameter of the largest return pipeline above the maximum flood level.

D.17

Outlet and Outlet Valve

D.17.1

The inside diameter of the outlet passage of uninsulated tanks shall not be less than the nominal inside diameter of a 1-1/2 in. (38 mm) (1.402 in. or 35.61 mm) 3-A sanitary fitting except for tanks of 10 gal (38 L) or less, on which 1 in. (25 mm) sanitary fittings may be used. The outlet shall be in a position that will provide complete drainage of the uninsulated tank. The top of the terminal end of the outlet passage shall be lower than the lowest point of the uninsulated tank.

D.17.2

The outlet valve for an uninsulated tank shall conform to the applicable provisions of the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, as amended, Parts I and II, Numbers 08-17A, 08-17B, 08-17C, 08-17E, 08-17F and 08-17H.

D.18

Inlet and outlet connections on the uninsulated tank shall be provided with welded stub ends, bolted or clamp-type flanges or 3-A sanitary threaded connections. The face of a bolted or clamp-type flange or a 3-A sanitary threaded connection below the maximum normal product level on uninsulated tanks having heat exchange surfaces to maintain product temperature shall be as close as practical but not to exceed the smaller of: (1) twice the nominal diameter of the connection or (2) 5 in. (130 mm) to the wall of the uninsulated tank.

D.19

Agitation

D.19.1

When specified, means for mechanical and/or air agitation of product shall be provided. When operated intermittently or continuously, the agitation shall be sufficient to maintain the butterfat content of whole milk throughout the uninsulated tank within a variation of plus or minus 0.1 percent as determined by an official AOAC Milk Fat Test.[4] The agitator, if not designed for mechanical cleaning, shall be located in such a manner that it shall be readily accessible and removable for manual cleaning. Mechanical agitators may be of a vertical or horizontal type. They shall comply with the applicable provisions of D.19.2 and D.19.3.

D.19.2

If a vertical mechanical agitator is used, an umbrella or drip shield of sanitary design that can be raised or readily demounted, to permit cleaning of all of its surfaces, shall be provided to protect against the entrance of contaminants into the uninsulated tank through the annular space around the agitator shaft. The agitator shaft, if removable, shall be provided with an easily accessible, readily demountable coupling of either a sanitary type located within the uninsulated tank or a coupling located outside the tank provided that it is above the umbrella provided to protect the annular space around the shaft.

D.19.3

For an agitator driving mechanism mounting, the driving mechanism shall be securely mounted in a position that will provide a minimum distance of 4 in. (100 mm) measured from the driving mechanism housing, excluding bearing bosses and mounting bosses, to the nearest surface of the uninsulated tank; and in such a manner that all surfaces of the uninsulated tank under or adjacent to the driving mechanism shall be readily accessible for cleaning and inspection.

D.19.4

When a seal is provided for vertical agitators, the design shall be such that (1) all product contact surfaces can be mechanically cleaned and (2) the seal assembly is easily accessible and readily demountable for inspection, or (3) be such that the seal may be readily disassembled for manual cleaning and inspection.

D.19.5

A bottom support or guide, if used, shall be welded to the tank and shall not interfere with drainage of the uninsulated tank and the inside angles shall have minimum radii of 1/8 in. (3 mm). When the agitator shaft has a bearing cavity, the diameter of the cavity shall be greater than the depth. When a bottom support or guide is designed for

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[4] *The method of making this test will be found in the following reference: Official Methods of Analysis, Available from AOAC International (formally Association of Official Analytical Chemists), 2200 Wilson Blvd., Suite 400, Arlington, VA 22201-3301 (703-522-3032).*

mechanical cleaning, provision must be made to permit separating the mating guide/bearing surfaces to permit inspection of
such surfaces.

D.19.6

A seal for the agitator shaft, if provided, shall be of a packless type, sanitary in design and durable. A seal shall be provided for (1) a horizontal agitator, (2) a vertical agitator when it is specified that the uninsulated tank is to be located so that the portion of the shaft outside the uninsulated tank is not in a processing or control area and (3) an agitator in an uninsulated tank having means for mechanically cleaning the uninsulated tank.

D.19.7

Any coil spring having product contact surfaces shall have at least 3/32 in. (2 mm) openings between coils, including the ends, when the spring is in the free position.

D.20

If air agitation is used, equipment and means for applying air under pressure shall conform to the applicable provisions of the 3-A Accepted Practices for Supplying Air Under Pressure in Contact with Milk, Milk Products and Product Contact Surfaces, Number 604-03. Tubing and related connections within the uninsulated tank shall be of a sanitary design and be readily demountable for cleaning outside the uninsulated tank or be designed for mechanical cleaning. If designed for mechanical cleaning the tubing and all related connections shall be self-draining. Permanently mounted air tubing shall be constructed and installed so that it will not sag, buckle, vibrate or prevent complete drainage of the uninsulated tank or tubing and shall be located so that the distance from the outside of the tubing to the tank wall shall be at least 2 in. (5 cm), except at the point of entrance.

D.21

Closed type uninsulated tanks shall be provided with a hooded air vent of sufficient free open area to prevent back pressure during filling and to prevent vacuum during emptying of the uninsulated tank. It shall be located in the front head near the top or in the top of the uninsulated tank. (See Appendix, Section H.) The vent shall terminate in a processing area or control area and shall drain into the uninsulated tank. It shall be provided with a perforated cover having openings not greater than 1/16 in. (2 mm) diameter, or slots not more than 1/32 in. (1 mm) wide. Woven wire mesh shall not be used for this purpose. It shall be so designed that parts are readily accessible and readily demountable for cleaning and inspection.

D.22

Raw product constant level tanks to be used in a pasteurizing system shall be designed to allow the use of an automatic device to control the raw product level. This level control shall be constructed to conform to the applicable provisions of 3-A Sanitary Standards for Pressure and Level Sensing Devices, Number 37-01.

D.23

A sample cock, if provided, shall be of a type that has its sealing surface relatively flush with the product contact surface of the uninsulated tank and have an inside diameter no less than that of 1 in. (25 mm) sanitary tubing.

D.24

A direct reading gauge of the plastic tube type, if provided, shall be sanitary in design and construction and shall be readily accessible for cleaning or shall be designed for mechanical cleaning. If designed for mechanical cleaning, the inside diameter of the gauge parts shall be sufficiently uniform that all product contact surfaces will be cleaned. It shall be designed and constructed so that all product in the gauge will be discarded. Means to accomplish this shall be provided at the lowest point and in such a manner that product in the gauge will not enter the uninsulated tank outlet line nor re-enter the uninsulated tank. The valve shall be close coupled. The distance, measured along the passage for the product in the uninsulated tank to the gauge valve, from the nearest point on the uninsulated tank to the ferrule or flange for the valve shall not be more than the smaller of (1) twice the nominal diameter of the passage or (2) 5 in. (130 mm).

D.24.1

Uninsulated tanks equipped with outside direct reading gauges shall have a maximum height of 96 in. (2500 mm).

D.25

Means of Supporting Uninsulated Tanks

D.25.1

The means of supporting an uninsulated tank shall be one of the following:

D.25.1.1

If legs are used, adjustable legs shall be provided of sufficient number and strength and so spaced that the filled uninsulated tank will be adequately supported. Legs shall be smooth with rounded ends and have no exposed threads. Legs made of hollow stock shall be sealed. Legs for uninsulated tanks, except those for raw product constant level tanks to be used in a pasteurizing system, shall be such that the product outlet is sufficiently high to allow for adequate cleaning and will provide an 8 in. (200 mm) minimum clearance between the floor except that raw product constant level tanks shall have a minimum clearance of 4 in. (100 mm). The legs of cylindrical horizontal uninsulated tanks shall be installed so that the legs will be vertical when the tank lining is pitched 1/4 in. per ft (20 mm per m) toward the outlet.

D.25.1.2

If mounted on a slab or island, the base of the uninsulated tank shall be such that it may be sealed to the mounting surface. (See Appendix, Section I.)

D.26

Any guard(s) required by a safety standard(s) that will not permit accessibility for cleaning and inspection shall be designed so that it (they) can be removed without the use of tools.

D.27

Nonproduct contact surfaces shall be smooth, free of pockets and crevices and be readily cleanable. Surfaces to be coated shall be effectively prepared for coating. Outside welds need not be ground.

D.28

Information Plate

D.28.1

Uninsulated tanks with a mechanical agitator shall have an

information plate in juxtaposition to the name plate giving the following information or the information shall appear on the name plate: "The agitator of this tank is designed so that the portion of agitator shaft outside of the tank * _____ in a processing area."

*Insert one of the following:

(a) does not have to be

(b) must be

D.28.2

If the tank is designed for steam sterilization, the information plate shall also contain the following information: "This tank is designed for steam sterilization."

D.28.3

All identification or information plate(s) affixed to uninsulated tanks shall be attached on the outside of the tank in such a way as to be effectively sealed.

APPENDIX

E

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved the carbon content of the stainless steel should not exceed 0.08 percent. The first reference cited in C.1 sets forth chemical ranges and limits of acceptable stainless steels of the 300 Series. Cast grades of stainless steel corresponding to types 303, 304 and 316 are designated CF-16F, CF-8 and CF-8M respectively. These cast grades are covered by ASTM*[5] specifications A351/A351M, A743/A743M and A744/A744M.

F

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide properly applied on stainless steel sheets is considered in compliance with the requirements of Section D.1 and D.2 herein.

G

MECHANICAL CLEANING

Suggested Cleaning Procedures

G.1

One cleaning method found to be satisfactory is to pump the cleaning solution to the top of the tank through welded stainless steel lines and distribute it in such a manner as to provide flooding over the entire inner top, side walls and bottom. Another cleaning method is to jet spray by pumping the cleaning solution to the top of the tank through a stainless steel nozzle located near the bottom of the tank. The solution should cover the entire inner top, side walls, bottom and all other interior surfaces of the tank.

G.2

The spray device should be removable for inspection. Means should be provided for manual cleaning of all surfaces not cleaned satisfactorily by mechanical cleaning procedures.

NOTE: Cleaning and/or sanitizing solutions should be made up in a separate tank — not the uninsulated tank. Do not allow halogen based sanitizing solutions (chlorine, iodine and bromine) to effect bactericidal action for longer than necessary or to dry upon the tank surfaces. Even though mechanical cleaning may be used for uninsulated tanks, it is important that periodic inspection of product contact surfaces be done to insure that adequate cleaning is being achieved with the mechanical cleaning regimen being used.

G.3

Successful mechanical cleaning of uninsulated tanks depends on properly designed tanks and properly located spray devices. The following illustrates one method of mechanically cleaning uninsulated tanks. Uninsulated tanks may be cleaned satisfactorily at flow rates of 0.10 to 0.30 gpm per sq ft (0.068 to 0.20 Lps per sq m) of internal tank surface. Cylindrical and rectangular tanks can be adequately cleaned when the spray patterns cover the upper 1/3 of the tank. If considerable appurtenances exist in the tank, special patterns may be required to cover these surfaces. This would require increases in the total flow rate. Tank rinsing using spray devices may be accomplished by three or more bursts of 15 to 30 sec duration, with the tank effectively drained between the successive bursts. For surfaces lightly soiled with milk, low-fat milk and milk by-products, satisfactory cleaning results can be achieved by: (1) applying a three-burst pre-rinse using tempered water; (2) recirculating a chlorinated alkaline detergent solution for 5 to 7 min at temperatures not to exceed 135 degrees F (58 degrees C); (3) applying a post-water rinse(s) sufficient to remove all residual alkaline detergent solution; and (4) recirculating an acidified final rinse for 1.5 to 2 min at tap water temperature. If the uninsulated tank is used for processing or holding cream, condensed products, ice cream mix or similar viscous products with higher fat and/or higher total solids content, the concentration, recirculating time and temperatures should be increased proportionately. Uninsulated tanks used for products comparable to milk and milk by-products can be effectively cleaned at concentrations of 1500 to 2000 ppm of alkaline detergent with available chlorine at 30 to 50 ppm. If these tanks are used for more viscous and/or higher total solids products, alkaline detergent concentration should be increased to 2500 to 3000 ppm.

AIR VENTING

To insure adequate venting of the tank which will protect it from internal pressure or vacuum damage during normal operation, the critical relationship between minimum vent-size and maximum filling or emptying rates should be observed. The size of the free vent opening of a tank should be at least as large as those shown in Table A-1.

TABLE A-1

Minimum Free Vent I.D. Opening Size		Maximum Filling Emptying Rate	
in.	mm	gal/min	L/min
1 3/4	45	175	66.0
2 1/4	57	300	1125
2 3/4	70	400	1500
3 3/4	95	700	2650

[5] Available from ASTM, 1916 Race St., Philadelphia, PA 19103-1187 (215-299-5400).

The above sizes are based on normal operation and are sized to accommodate air only and not liquid. A perforated vent cover, if used, should have a free opening area equal to at least 1-1/2 times the area of the vent opening in the tank. The venting system covered in the preceding paragraphs is intended to provide for venting during filling and emptying; however, it is not adequate during cleaning. During the cleaning cycle, tanks when mechanically cleaned should be vented adequately by opening the manhole door to prevent vacuum or pressure build-up due to sudden changes in temperature of very large volumes of air.[*6] Means should be provided to prevent excess loss of cleaning solution through the manhole opening. The use of tempered water of about 95 degrees F (35 degrees C) for both pre-rinsing and post-rinsing is recommended to reduce the effect of flash heating and cooling. Provisions should be made to prevent over-filling with resultant vacuum or pressure damage to the storage tank.

I

SLABS OR ISLANDS

When an uninsulated tank is designed to be installed on a slab or an island, the dimensions of the slab or island should be such that the uninsulated tank will extend beyond the slab or island at least 1 in. (25 mm) in all horizontal directions. The slab or island should be of sufficient height so that the bottom of the outlet connection is not less than 8 in. (200 mm) above the floor. The surface of the slab or island should be coated with a thick layer of waterproof mastic material, which will harden without cracking. The junction of the uninsulated tank and the slab or island should be effectively sealed.

J

MANUAL CLEANING

If the inside height of an uninsulated tank exceeds 96 in. (2.45 m), one means for manual cleaning is to weld a stainless steel rung on each end of the uninsulated tank to support a removable platform at a height which will facilitate cleaning and inspection.

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*[*6] For example, when a 6,000 gal tank (with 800 cu ft of 135 degrees F hot air after cleaning) is suddenly flash cooled by 50 degrees F water sprayed at 100 gpm the following takes place: Within one second, the 800 cu ft of hot air shrinks approximately 51 cu ft in volume. This is the equivalent in occupied space of approximately 382 gal of product. The shrinkage creates a vacuum sufficient to collapse the tank unless the vent, manhole, or other openings allow the air to enter the tank at approximately the same rate as it shrinks. It is obvious, therefore, that a very large air vent such as the manhole opening is required to accommodate this air flow.*

These standards shall be effective May 22, 1993, at which time the 3-A Sanitary Standards for Uninsulated Tanks for Milk and Milk Products, Number 32-00, are rescinded and become null and void.

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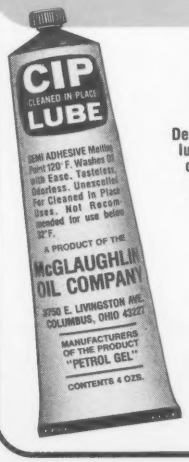

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111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
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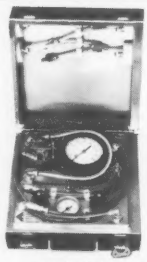

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Coming Events

1993

January

•**4-8, 44th Annual Ice Cream Manufacturing Short Course** will be offered by the Department of Food Science, Cook College, Rutgers University. For more information contact the Offices of Short Courses and Conferences, Cook College, Rutgers University, P. O. Box 231, New Brunswick, NJ 08903, Telephone (908)932-9271.

•**13-15, FoodPack of the Americas '93 Exposition and Conference** to be held at the Coconut Grove Convention Center, Miami, FL. For more information contact FoodPack of the Americas, Inc., 200 N. Glebe Road, Suite 900, Arlington, VA 22203-3787; Telephone (703)527-3663; FAX (703)527-7750.

•**19, Alberta Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the University of Alberta Faculty Club (downstairs), Edmonton, Alberta. For more information, contact James Steele at (403)427-2643.

•**21, Surfactants in Foods (previously Emulsifiers in Foods),** offered by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone (612)454-7250; FAX (612)454-0766.

•**25-28, Basic Food Plant Sanitation Workshop**, sponsored by the American Institute of Baking, will be held in Manhattan, KS. For more information contact AIB, 1213 Bakers Way, Manhattan, KS 66502, telephone (913)537-4750, (800)633-5137, FAX (913)537-1493.

February

•**2-5, The Third International Dairy Housing Conference**, sponsored by the American Society of Agricultural Engineers, will be held in Orlando, FL. For more information contact The American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085-9659, (616)429-0300; FAX (616)429-3852.

•**3-4, Food Processors Sanitation Workshop,** presented by the University of California Cooperative Extension, to be held at the Holiday Inn - Mission de Oro, Santa Nella, CA. For more information contact Heidi Fisher, Food Science and Technology, University of California, Davis, CA 95616, (916)752-1478.

•**15-18, Freezing Technology Short Course** to be held at the University of California-Davis, Davis, CA. For more information or to enroll, call (800)752-0881. From outside California, call (916)757-8777.

•**22-23, Sanitation for Warehousemen**, sponsored by the American Institute of Baking, will be held in Manhattan, KS. For more information contact AIB, 1213 Bakers Way, Manhattan, KS 66502, telephone (913)537-4750, (800)633-5137, FAX (913)537-1493.

•**22-23, Dairy and Food Industry Conference; Focus on Food Ingredients** to be held at Ohio State University, Columbus, OH. For more information contact Dr. Ken Lee, Department of Food Science and Technology, 2121 Fyffe Road, Ohio State University, Columbus, OH 43210-1097 or call (614)292-6281; FAX (614)292-0218.

•**23-25, Kentucky Association of Milk, Food and Environmental Sanitarians, Inc.'s Annual Meeting** will be held at the Quality Hotel Riverview, 666 W. 5th Street, Covington, KY 41011. For more information please contact Anita Travis at (502)564-3127.

•**26, BISSC Annual Membership Meeting** will be held at the Chicago Marriott Hotel, Chicago, IL. For more information, contact the BISSC headquarters at 401 North Michigan Avenue, Chicago, IL 60611; (312))644-6610.

March

•**5-9, Statistical Quality Control** to be held at the University of California-Davis, Davis, CA. For more information or to enroll, call (800)752-0881. From outside California, call (916)757-8777.

•**15-17, Food Product Development/Ingredient Technology** to be held at the University of California-Davis, Davis, CA. For more information or to enroll, call (800)752-0881. From outside California, call (916)757-8777.

•**15-17, Microbiology and Engineerting of Sterilization Processes** to be held at the St. Paul Campus of the University of Minnesota. For further information, contact Dr. William Schafter, course coordinator, Department of Food Science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108, (612)624-4793.

•**15-18, Better Process Control School** to be held at the University of California-Davis, Davis, CA. For more information or to enroll, call (800)752-0881. From outside California, call (916)757-8777.

•**17, Indiana Dairy Industry Conference** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, (317)494-8279.

•**18-19, Florida Association of Milk, Food and Environmental Sanitarians Annual Meeting** in conjunction with Suppliers Night at the Marriott on International Drive. For more information, please contact Bill Thornhill, 3023 Lake Alfred Road, Winter Haven, FL 33881, (813)299-6555.

•**22-24, Introduction to Statistical Methods for Sensory Evaluation of Foods** to be held at the University of California-Davis, Davis, CA. For more information or to enroll, call (800)752-0881. From outside California, call (916)757-8777.

•**22-26, Midwest Workshop on Milk, Food and Environmental Sanitation** to be held at Ohio State University, Columbus, OH. For more information contact Dr. Matrid Ndife, Department of Food Science and Technology, 2121 Fyffe Road, Ohio State University, Columbus, OH 43210-1097 or

call (614)292-3069; FAX (614)292-0218.

•**22-26, Molds and Mycotoxins in Foods,** offered by the American Association of Cereal Chemists, will be held in Lincoln, NE. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone (612)454-7250; FAX (612)454-0766.

•**23-25, Food Extrusion,** offered by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone (612)454-7250; FAX (612)454-0766.

•**26-28, Sensory Evaluation: Overview and Update** to be held at the University of California-Davis, Davis, CA. For more information or to enroll, call (800)752-0881. From outside California, call (916)757-8777.

April

•**7-9, Missouri Milk, Food and Environmental Health Association's Annual Education Conference** will be held at the Ramada Inn, Columbia, MO. For more information contact Janet Murray at (816)263-6643.

•**14-15, Food Micro '93,** sponsored by the Food Processors Institute (FPI), will be held at the Hyatt Regency-Crystal City, Arlington, VA. For more information contact Rita Fullem, FIP's executive director, at (202)639-5944.

•**19-22, Purdue Better Process Control School** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, (317)494-8279.

•**20-22, NIR Spectroscopy,** offered by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone (612)454-7250; FAX (612)454-0766.

May

•**2-7, National Conference on Interstate Milk Shipments 1993 Meeting** will be held at the Sheraton Central Park Hotel, Arlington, TX. For more information contact Leon Townsend, Executive Secretary/Treasurer, National Conference on Interstate Milk Shipments, 110 Tecumseh Trail, Frankfort, KY 40601, telephone and/or FAX (502)695-0253.

•**6-12, INTERPACK 93, 13th International Trade Fair for Packaging Machinery, Packaging Materials and Confectionery Machinery,** will be held at the fairgrounds in Dusseldorf, Germany. For further information on exhibiting at or attending INTERPACK 93, contact Dusseldorf Trade Shows, Inc., 150 North Michigan Avenue, Suite 2920, Chicago, IL 60601,(312)781-5180; FAX (312)781-5188.

•**10-13, Purdue Aseptic Processing and Packaging Workshop** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, (317)494-8279.

June

•**20-23,** Joint International Summer Meeting **of The American Society of Agricultural Engineers and The Canadian Society of Agricultural Engineering** to be held in Spokane, WA. For more information contact The American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085-9659, (616)429-0300; FAX (616)429-3852.

July

•**16-23, Rapid Methods and Automation in Microbiology: International Workshop XIII** to be held at the Kansas State University, Manhattan, KS. For more information contact Dr. Daniel Y. C. Fung, Workshop Director, telephone (913)532-5654, FAX (913)532-5681. A mini--symposium will occur on July 16-17.

August

•**1-4, 80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.** to be held at the Stouffer Waverly Hotel, Atlanta, GA. For more information please contact Julie Heim at (800)369-6337 (US) or (800)284-6336 (Canada).

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 200W Merle Hay Centre, 6200 Aurora Avenue, Des Moines, IA 50322.

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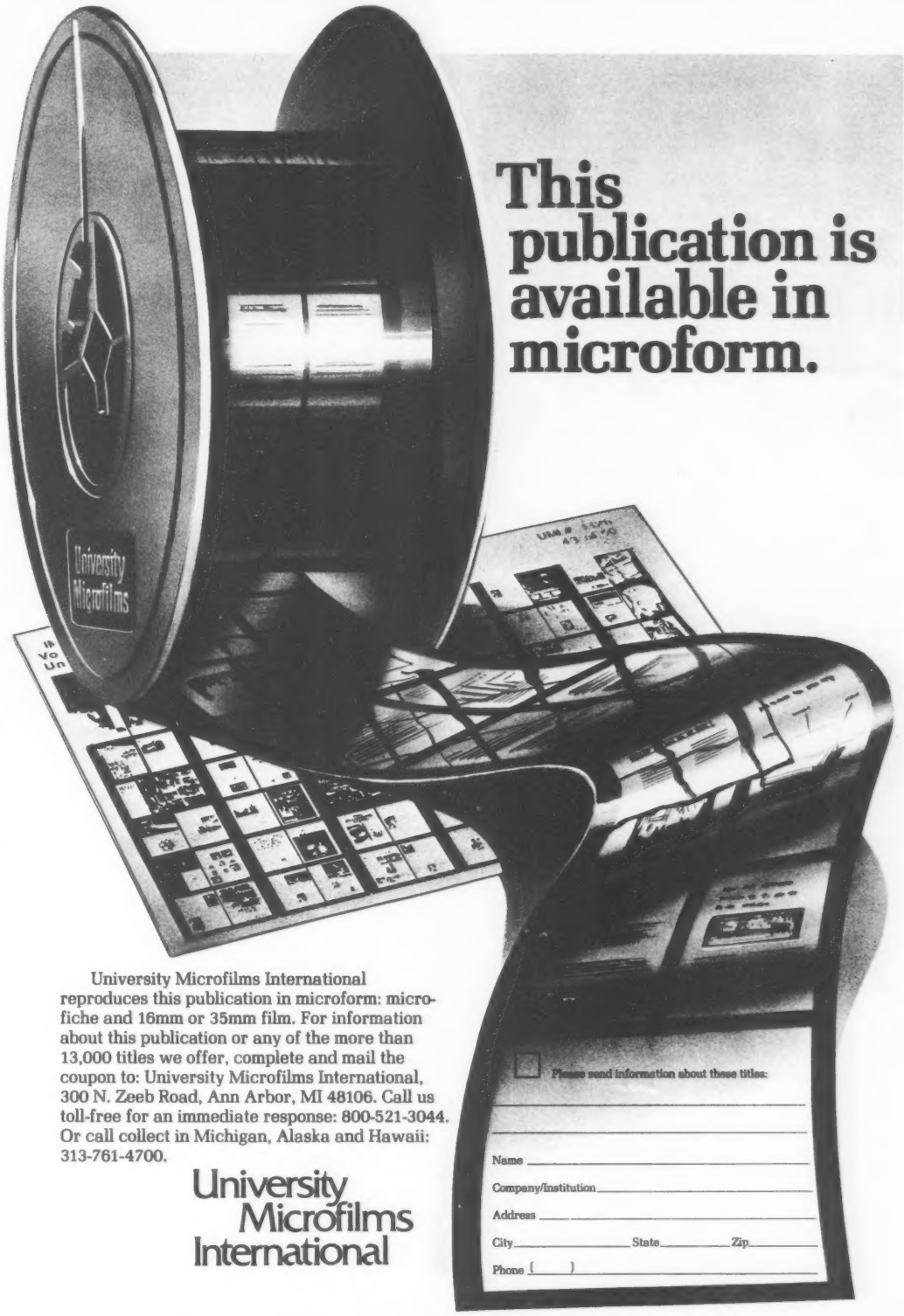

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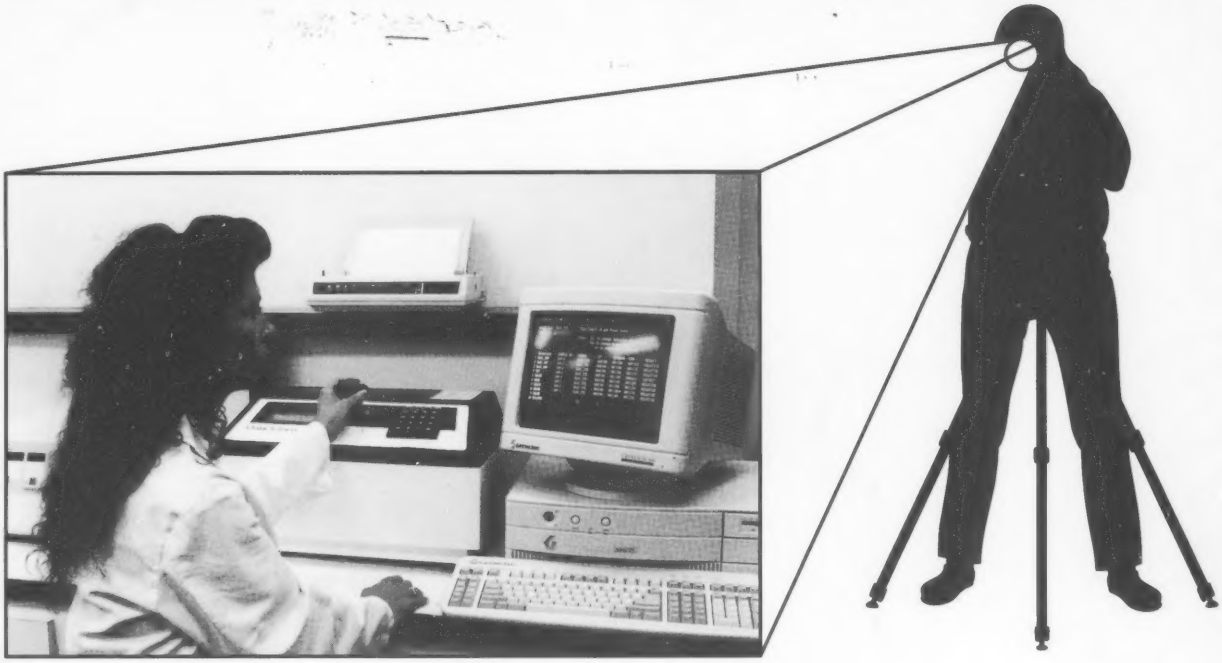

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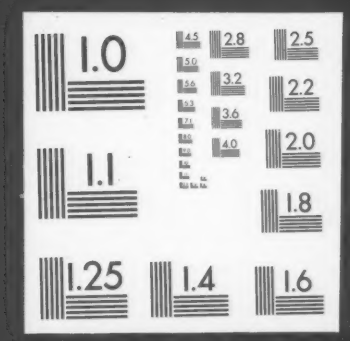
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